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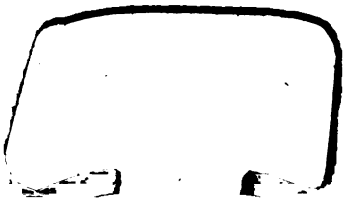

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The Canadian Entomologist.

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HEMIPTERA FROM MUSKOKA LAKE DISTRICT.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

This list is presented as a slight contribution to our knowledge of the geographical distribution of the North American Hemiptera. As our literature of this order is by no means overburdened with faunal lists, I trust that the present will find sufficient excuse for its appearance in the matter it contains. I have made every effort to have the list as accurate and complete as possible, under the circumstances. The material was accumulated during a brief collecting tour in the Muskoka Lake District of Canada, in the interval from July 25th to August 3rd, 1888. The particular localities being in the vicinity of Bracebridge, along the Muskoka River to the Lake, and some of the adjoining islands, and along the road from Bracebridge to South Falls.

For the information of such as are not conversant with the physical features of this beautiful Lake District, I will add that it lies in the metomorphic belt reaching eastward from the Georgian Bay. The surface is somewhat rugged, with bold, rocky bluffs from one hundred to two hundred feet in height, skirting the river and lowlands; the latter presenting a good depth of soil, which is elsewhere very thin, in many places quite insufficient to cover the rocks. Coniferæ, poplars, birches, and a few oaks form the bulk of the timber on the rocky highlands, with the addition of maple, hickory, beech, basswood, etc., on the deeper soils. The undergrowth is largely hazelnut, with blueberry, raspberry, viburnum, spiræa, and other bushes interspersed. Away from the cultivated areas very little grass is to be found; but carex, cypreus and glyceria take its place to a large extent. The bane of this land is the ever-recurring "bush-fire," and to an entomologist a "burned district" is a wilderness indeed.

The Hemiptera taken were largely such as might have been expected from this locality, but were more numerous in individuals than I had

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anticipated; the Homoptera especially, seemed proportionately more numerous than farther south, and included many rarities.

I am indebted for a number of the species here enumerated, to the kindness of Mr. A. H. Kilman, who was one of our party, and who passed over to me any luckless Hemipter that perchance found lodgment in his indefatigable umbrella. To Mr. P. R. Uhler, I am under renewed obligations for the determination of some of the more difficult forms, especially in the Capsidæ.

HETEROPTERA.

Scutelleridæ.

Homœmus ænifrons Say. Occasional on sedges and weeds on the lowlands.
Eurygaster alternatus Say. Abundant with the last.

Corimelænidæ.

Corimelæna atra Am. and Serv. One nymph taken.
Corimelæna pulicaria Germ. A single example.

Pentatomidæ.

Podisus spinosus Dall. Taken here as elsewhere on trees and bushes, but more rarely than the next.
Podisus modestus Dall.
Neottiglossa undata Say. Common.
Cosmopepla carnifex Fab.
Mormidea lugens Fab. One example.
Euchistus fissilis Uhl.
Euchistus tristigmus Say. Occasional.
Banasa calva Say. Abundant on the arbor-vitæ.

Coreidæ.

Alydus eurinus Say. Frequent on flowers of the Canada thistle in old fields.
Protenor Belfragei. Hagl. = *Tetrarhinus Quebecensis* Prov. One nymph swept from weeds.

Berytidæ.

Neides muticus Say. Common.
Corizus punctiventris Dall. Larger and darker coloured than examples from Buffalo.
Corizus nigristernum Sign. Less abundant than the preceeding. At Buffalo it is the common form.

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Lygæidæ.

Nysius grœnlandicus Zett. Scarce.

Cymus luridus Stâl. Three examples, swept from a low swampy spot by the roadside, near South Falls.

Cymus angustatus Stâl. Not common.

Cymus claviculus Hahn. Abundant everywhere on the lowlands.

Blissus leucopterus, Say. One brachypterus example, swept from the borders of an oat field on Muskoka river, near the lake.

Geocoris borealis Dall. Taken with the preceeding. This appears to be but a dark variety of *G. bullatus* Say.

Ligyrocoris sylvestris Linn. Very abundant in the cultivated districts.

Peliopelta abbreviata Uhl. One small, short-winged example captured.

Capsidæ.

Brachytropis calcarata Fall.

Trigonotylus ruficornis Fall.

Miris affinis Reut.

Collaria Meilleurii Prov. These four species were not uncommon where cultivation had prepared the way for them. The latter was just coming to perfection.

Hadromena pulverulenta Uhl. (MS.) Two examples.

Diommatus congrex. Uhl. Rare.

Phytocoris eximus. Reut. Occasional.

Phytocoris pallidicornis Reut. Abundant, and of large size.

Phytocoris colon. Say. One example.

Neurocolpus nubilus Say. Common, and as a rule, deeply coloured.

Calocoris rapidus Say. A single specimen.

Melinna modesta Uhl. Beaten from pine trees.

Lygus pabulinus Linn.

Lygus pratensis Linn.

Lygus flavonotatus Prov. A few taken.

Lygus invitus Say. Common.

Lygus intersectus Uhl. (MS.) Abundant.

Coccobaphes sanguinarius Uhl. Not uncommon on maple and beech trees, especially near South Falls.

Pœciloscytus unifasciatus Fab. Numbers taken on the cultivated uplands south of Bracebridge, and elsewhere.

Pœcilocapsus lineatus Fab. Rare.

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Largidea opaca Uhl. (MS.) Smaller and slighter than New York examples.

Camptobrochis grandis Uhl. Common. Apparently of nocturnal habits, as I took several flying around the candle at our camp; some of these individuals were extremely dark, even approaching an almost uniform piceous black; others were as pale as those taken near Buffalo.

Neoborus Petitii Uhl. (MS.) Several pale examples.

Fulvius anthocoroides Uhl. One example.

Monalocoris filicis Linn. Common everywhere on ferns.

Hyaliodes vitripennis Say. This neat little species was taken frequently on pines, and occasionally on other trees and bushes.

Pilophorus amœmus Uhl. Common on pine trees.

Globiceps flavomaculatus Fab. One example taken. This species was erroneously cited as occurring at Buffalo, in my list of Capsidæ from that locality (CAN. ENT., xix., p. 72, 1887). The insect there referred to was the next, which superficially resembles the *flavomaculatus*.

Mimoceps gracilis Uhl. (MS.) A few swept from grass and weeds near a rivulet among the hills.

Mecomma gilvipes Uhl. (MS.) Three examples taken with the preceeding.

Macrolophus seperatus Uhl. Three examples.

Stiphrosoma stygica Say. Scattering.

Labops hesperia Uhl. A few brachypterus examples swept from an oat field on the flats near the mouth of the river.

Idolocoris agilis Uhl. Common on the lowlands.

Orthotylus alternatus Uhl. Common on bushes, especially the hazelnut.

Macrotylus guttatus Uhl. (MS) One example of this elegant little Capsid was swept from briars growing on a rocky hillside near the river.

Rhinocapsus Vanduzeii Uhl. (MS.) Not uncommon among rank weeds in damp situations.

Psallus variabilis Fall. A single example.

Psallus antennatus Uhl. (MS.) Several taken.

Plagiognathus obscurus Uhl.

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Agalliastes associatus Uhl. One example of the typical form occurred to me while sweeping near South Falls.

Anthocoridæ.

Dolichomerus elongatus Reut.

Dilasia fuscula Reut Two examples taken from a log of hard maple; they occurred under loose bark where there was a slight fungoid growth.

Triphelps insidiosus Say. Common.

Anthocoris musculus Say.

Tingitidæ.

Galeatus Peckhami Ashm. (*Sph erocysta Peckhami*, Ent. Am, vol. iii., p. 156). Swept from low weeds—probably a dwarf vaccinium or a species of aralia, which were growing together—among pines on a rocky island. I am indebted to Mr. Uhler for this generic reference. The three examples taken agree in every respect with Mr. Ashmead's description, and I think there can be no doubt of their identity.

Corythuca arquata Say. (?). The small form, which is probably a distinct species, occurred abundantly on birches everywhere. I have taken it from osier bushes at Machias, N. Y., also at Pine Swamp, near New Haven, Ct. If distinct it would seem to be the northern analogue of *C. arquata.*

Corythuca marmorata Uhl. One example.

Aradidæ.

Aradus quadrilineatus Say.

Aradus rectus Say.

Reduvioidea.

Coriscus subcoleoptratus Kirby.

Coriscus inscriptus Kirby. Common.

Coriscus ferus Linn.

Sinea diadema Fab. Scarce.

Opsicœtus personatus Linn. Bracebridge. One example.

Hydrobatidæ.

Hygrotrechus remigis Say.

Limnotrechus marginatus Say. Abundant in favorable localities.

Limnoporus rufoscutellatus Latr. One example.

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Metrobates hesperius Uhl. Muskoka Lake. On pleasant afternoons, when the surface of the water was smooth, these insects would congregate in immense numbers, closely covering an area of several yards in extent. A breeze, sufficient to slightly ruffle the surface, would quickly disperse them, but whither I failed to discover, as I was unable to detect any along the shore. The majority of the specimens taken were immature; they differ from the adult in having five, pale yellow spots in addition to the pronotal—one on the centre of the metanotum, one above each anterior, and another before each posterior coxa.

Salididæ.

Salda interstitialis Say. Common along the shores of the river and lake.

HOMOPTERA.

Cicadidæ.

Cicada canicularis Harris. The familiar shrilling of this species was frequently heard in the heat of the day among the tree tops.

Membracidæ.

Enchenopa binotata Say. Apparently rare.

Ceresa bubalus Fab. Common, but mostly of the small dark coloured variety, with blunt thoracic horns.

Ceresa diceros Say. Occasional.

Telamona coryli Fitch. Abundant on the hazelnut. The females are frequently of an almost uniform brownish-ferrugineous, with but slight indications of the pale bands, thus approaching closely the next, from which it probably is not distinct.

Telamona tristis Fitch. Common with the preceding.

Telamona fagi Fitch. One example.

Telamona reclivata Fitch. Three examples. Variable both in colour and form of the crest; this being sometimes sharply angled behind, or again obtusely rounded; and the posterior edge may be either sloping or almost vertical. The present examples are very dark in colour, the pale areas being much obscured by fuscous punctures.

Carynota marmorata Say. Numbers taken from a small poplar bush (probably *P. grandidentata*), on the uplands south of Bracebridge.

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My examples correspond with Say's short description, except that the tip of the thorax extends to, and in some cases beyond, the apical areole. According to the characters given by Say, it must belong here and not to *Cyrtosia*, where it is placed by Dr. Fitch.

Smilia camelus Fab. Two examples beaten from oaks.

Cyrtosia vau Say. Not infrequent on trees.

FULGORIDÆ.

Sub-family *Cixiidæ*.

Cixius stigmatus Say. Not common.

Cixius pini Fitch. Occasional on various low bushes; rarely on pine. Near Buffalo I have taken it only on vaccinium.

Oliarus quinquelineatus Say. More abundant than the preceding forms.

Sub-family *Delphacidæ*.

This family was well represented, but I have not studied the material taken.

Sub-family *Achelidæ*.

Two undetermined species of this family occurred in single examples.

Sub-family *Derbidæ*.

Otiocerus Coquerbertii Kirby. Not uncommon on maple and beech trees.

Otiocerus Degeerii Kirby. Beaten from oak and beech trees. Another small and probably undescribed form occurred, which I had the misfortune to lose while in the field.

Anotia sp. One example taken among bushes on the bank of the river at Bracebridge. It is, perhaps, a variety of *Bonneti* Kirby.

Lamenia vulgaris Fitch. Abundant and of large size.

Sub-family *Issidæ*.

Bruchomorpha oculata Newm. Abundant in damp grassy localities, especially on the lowlands. One example has the elytra fully developed. They are long and narrow, somewhat surpassing the

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abdomen in length; sides parallel, not widened at tip; of a deep smoky-brown colour, almost opaque. Nerves very strong and simple, the radial and two ulnar nerves run straight and undivided to the transverse nerve, which crosses the elytra a little beyond the tip of the clavus, forming three large cells on the base of the corium; the second ulnar is forked at the transverse nerve, the first ulnar is twice forked beyond the transverse, and between this and the radial is a short nerve from the transverse to the costa; these forming seven apical cells, of which the medial is small and triangular, and the next inner the largest and rectangular; the claval nerves unite beyond the middle, the resulting nerve joining the claval suture just before its apex.

Peltonotus histrionicus Stal. One example. Occurs also at Buffalo.

Cercopidæ.

Lepyronia quadrangularis Say. Rare.

Aphrophora quadrinotata Say. Very abundant on the lowlands, but mostly immature; the imagines were just beginning to appear.

Aphrophora parallella Say. Common on pines.

Aphrophora saratogensis Fitch. Rather more abundant than the preceeding, with which it occurred and which it greatly resembles; it is, however, readily distinguished by the more obtuse head, clearer markings, and concolorous punctures.

Clastoptera obtusa Say. Very common on the blueberry.

Clastoptera proteus Fitch. With the last.

Bythoscopidæ.

Idiocerus pallidus Fitch. Abundant on willows, birches, etc.

Idiocerus suturalis Fitch. On low poplar bushes near the river; even more abundant than the preceeding.

Idiocerus lachrymalis Fitch. Numbers of this, our largest species, occurred on birch and other trees.

Idiocerus alternatus Fitch. Scarce. It is with slight misgivings that I place this insect here, although I believe future study will justify the reference.

Agallia novellus Say. As abundant at Muskoka as in New York; on grass and weeds.

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Agallia flaccida Uhl. But few of this common species were seen at Muskoka.

Agallia siccifolia Uhl. Not uncommon in dry pastures.

Pediopsis viridis Fitch. Apparently rare.

Pediopsis variabilis Fitch. Examples occurred of varieties *A.* and *C.* of Fitch, and a single specimen of a uniform ferrugineous, with pale yellow elytra crossed from the shoulder to the apex by a broad ferrugineous band.

Pediopsis minor Fitch. Two examples.

Pediopsis fenestratus Fitch. A common species on birch trees.

Tettigonidæ.

Oncometopia costalis Fab. Very abundant among coarse weeds and grass, particularly near South Falls, where the pretty striped nymphs occurred with the newly developed imagines.

Diedrocephala coccinea Forst. Not uncommon on blackberry bushes.

Diedrocephala mollipes Say. Common.

Diedrocephala novæboracensis Fitch.

Helochara communis Fitch. Common.

Euacanthus orbitalis Fitch. A few examples taken.

Gypona 8-lineata Say. The form named *flavilineata* by Dr. Fitch occurred abundantly on various trees and bushes. I place this variety with *8-lineata* Say, as it seems impossible, on a superficial examination, to find any constant characters for separating the two forms, although they have every appearance of being distinct species. Some of the examples taken exhibit no indications of the yellow lines on the head, pronotum and scutellum, while all are extremely variable in the elytral venation. A careful study of our northern species of *Gypona* is needed.

Jassidæ.

Acocephalus vitellinus Fitch. One example.

Grypotes unicolor Fitch. Not uncommon.

Cicadula (Macrosteles) quadrilincata Forbes. A few examples of this common species occurred on cultivated lands. Near Buffalo it is

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quite variable, some individuals corresponding very closely with Mr. Uhler's description of *Jassus divisus*, with which this may prove identical.

Thamnotettix eburata n. sp. Form and aspect of *clitellaria* Say, to which it is closely related. Above brown with a large white discal spot, beneath white; venter marked with black and yellow ♂, or whitish ♀. Vertex pale yellow, whitish on the base, slighly suffused with ferrugineous on each side near the eye; a central impressed line extending about half way to the apex. Face whitish, slightly tinged with yellow. Antennæ white, setæ brown. Pronotum and scutellum dark ferrugineous or fuscous, the latter paler with a transverse impressed black line before the apex, behind which the edges are narrowly yellow, and slightly calloused. Hemielytra;—Clavus fuscous, the common disc with a large, obtusely cordate, ivory white spot which is slightly suffused with yellow; behind this spot is a dark area. Costal half of the corium milky white, almost opalescent, tip broadly fuscous; discal half brownish ferrugineous, paler posteriorly, and shading to fuscous along its junction with the white costal area. Beneath and legs white, immaculate; small spines at tip of the tibiæ and tarsal joints slightly embrowned; claws black. Venter black, posterior edge and disc of the segments yellow; the latter with a central black line, represented by dots on the three basal segments; convexivum yellow; tergum black. Wings milky hyaline, veins faintly brownish. The female differs from the male in being somewhat paler, in having the discal spot of the elytra more yellowish, and the abdomen pale yellow or whitish. In the venation of the elytra and other structural features this species agrees very closely with *clitellaria*. The ♂ has the last ventral segment slightly concave posteriorly; valves obtusely triangular, black; plates white, sparsely covered with long concolorous hairs. The ♀ has the last ventral segment black, with the lateral margins pale; as in *clitellaria* it is deeply incised each side of the middle, leaving a central tongue, which is minutely emarginate at tip; pygofers pale, suffused with brown toward the central groove, and fringed with long pale hairs. Length, ♂ 5 mm.; ♀ 5½–6 mm. A male was swept from grass near a rivulet at Bracebridge; also taken in the vicinity of South Falls.

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Athasanus striola Fall. Occurred abundantly near South Falls, on a low meadow overgrown with swamp grasses; here they were of large size, measuring in some cases 6 mm. to tip of the elytra; elsewhere, scattering and of normal size.

Allygus irroratus Say. Taken in moderate numbers. Both the normal form and the large variety, with the vertex produced and flattened, occurred together here as elsewhere; the variety predominating in moist situations.

Jassus immistus Say. Common among low bushes and briars. This pretty insect seems to be congeneric with a form occuring near Buffalo, of which I have seen specimens in the National Museum labelled *Scophoideus jucundus* Uhl. A third and undescribed species occurred to me at Muskoka.

Platymetopius acutus Say. Moderately abundant.

Deltocephalus debilis Uhl. Rare. Occurs also at Buffalo.

Deltocephalus configuratus Uhl. Abundant here as elsewhere.

Deltocephalus sayi. Fitch. Scarce.

Deltocephalus inimicus Say. Very common on cultivated lands.

Typhlocybidæ.

Several species of these minute insects occurred; but as the North American species have been but little studied they are omitted from the present list.

Psyllidæ.

Psylla carpini Fitch. Abundant on the blue beech.

Aphididæ.

Want of time precluded any attempt at collecting the *Aphididæ* and *Coccidæ.*

In addition to the 141 species here enumerated a number of doubtful forms were taken, belonging mostly to the Homoptera; giving a total of something over 150 species as the fruits of ten days collecting.

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FURTHER NOTES ON CHIONOBAS JUTTA.

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

Our President has asked me what methods I adopted for the raising of *C. jutta* from the egg. I will endeavour to describe them.

As it is well known that larvæ of the genus *Chionobas* feed on grasses, my first care was to determine what grasses were to be found in the haunts of *Jutta*, and to notice the circumstances under which they grew. I found several, all rooted in the sphagnum of the swamp. I took home roots of every kind, and potted them in sphagnum, being careful to close the hole in the bottom of each flower pot with a cork, and to soak the plants thoroughly with rain water. I soon had a number of thriving plants. I placed the pots containing these—so near together that some of the blades of every plant intermingled with blades of the rest—in a box of convenient size; and I filled up the interstices, to the level of the rims of the pots, with sphagnum. I then made a slight, arched lattice over the top of the box, and stretched a piece of green netting over it. My cage was then ready. When *Jutta* was pretty well worn, *i. e.*, about the 12th of June, I captured two or three females, and placed them in my cage. On the 17th of that month I found a number of eggs, not laid on the blades of grass, but scattered over the netting. When the larvæ appeared, I placed, by means of a camel's hair pencil, a few of them on each plant; but I soon found that they congregated on the sedge. This then, I concluded, was their favourite food-plant. I kept the cage on the seat of an open window with a north-western aspect; and, whenever it rained I removed the covering of the box, and let the insects have the benefit of the shower. In dry times I occasionally sprinkled them at sunset with soft water.

In August I noticed that my insects were seriously decreasing in number. As their habits were unknown I thought it possible that the vanished specimens had buried themselves in the sphagnum, and would in due time again appear; but a wounded larva, that had evidently been nipped by a foe, at length aroused my suspicions. I procured fresh plants of sedge, placed upon them all the larvæ I could find, and then spread a large sheet of paper, and upon it pulled all the old bedding to pieces. The result was that I found, not the lost larvæ, but several very well grown specimens of *Lithobius Americanus*. I consider this creature therefore a

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foe to be guarded against. On the approach of winter the care of *Jutta* became perplexing—the more so as I was about to leave for England. I at length resolved to place the case, near a window, in a outer passage leading to a dairy. There it would be, I thought, sufficiently removed from the warmth of the house, and would escape the crushing weight of the winter's snow. I left the larvæ supplied abundantly with sedge growing in well soaked sphagnum. On my return in February only six of the larvæ remained. They were torpid, but fresh and plump. A mild day came, and one of the larvæ revived; but the mild day was followed by a bitter night, and the adventurous larva perished. When the others began to revive I moved the cage into a room where the temperature could be better regulated. Of the remaining larvæ one afterwards died and four went into chrysalis. The chrysalids were naked, unattached, and lay on the surface, or just below the surface of the sphagnum. I sent one of them to Mr. W. H. Edwards, and one I preserved as a specimen. The other two produced butterflies. The first of these appeared on the 31st of May, and was crippled. I thought that perhaps I had kept the chrysalis too dry, and I sprinkled the one remaining with fresh water. Next day a beautiful and fully developed female *Jutta* presented itself, crowning my efforts with success. It was as large as the largest specimens I had taken in a state of nature. The only difference I could perceive—and it was hardly perceptible—was that the insect raised in captivity was of a somewhat paler brown than the others.

ONE WORD MORE ABOUT RILEYA.

BY L. O. HOWARD, WASHINGTON, D. C.

(See Mr. Ashmead's communication in December CAN. ENT.)

Without entering further into the discussion of priority, beyond stating that Mr. Ashmead is wrong in his points (1), that my original communication was read after the publication of his synoptical table, (it was read two days before the receipt of the number of *Entomologica Americana*, in which the table was published), and (2), that his full description was published before mine; (mine was published nine days before the receipt of the Kansas bulletin). I wish to say just a word in reply to his supposi-

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tion as to the identity of *Lonchocerus* Dahlbom and *Rileya* Howard. His statement that I had not consulted the European literature is, of course, uncalled for and absurd. I had not only familiarized myself with the European descriptions, but had sent specimens to Dr. Mayr, who so ably monographed the European Encyrtinæ some years ago, and whose opinion corroborated my own as to the novelty of this form. Mr. Ashmead's comparison of Thomson's description with my own must have been most hurried, as they differ so widely that I would advise him to retract his expressed opinion for the sake of his entomological reputation.

I tabulate here the differences which can be noted from comparison of the two descriptions and my figure of *Rileya*. The quoted portions in the *Rileya* column are from the description, and the unquoted portions can be verified from the figure. *Lonchocerus*, by the way, is nothing but a synomym of *Mira*, if Thomson is right in supposing that Dahlbom founded the genus for Dalman's *Encyrtus platycerus*. Dahlbom's genera in the Encyrtinæ were described, however, without any indication of types.

RILEYA HOWARD.	LONCHOCERUS DAHLBOM.
"Face * * * gently rounded, and has a strong, glistening, transverse, clean-cut ridge just above the insertion of the antennæ."	"Caput subtriangulare, vertice sat lato, lateribus tereti, medio subacuto."
Antennal club not jointed.	"Clava 3-articulata."
Mesoscutum transverse, "highly polished."	"Mesonoto [mesoscutum] haud transverso, dense albo-sericeo."
"The mesoscutellum has a strong tuft of erect, black hairs" at tip only.	"Scutellum dense holocèriceo-pubescens."
Wings not shortened; when closed reaching considerably beyond tip of abdomen.	"Alæ abbreviatæ, Thorace vix superantes."
"The stigmal vein is given off immediately at the juncture of the submarginal with the costa." Consequently there is *no* marginal vein.	"Stigmate [marginal vein] lineari, distincto."
Abdomen flattened ovate, cutely pointed behind, "highly polished."	"Abdomen subglobosum, dense albo-pubescens."

In conclusion, I wish to apologize for the slip (or misprint) in the use of "1887" for "1888." The change does not alter the relative order of the events, and the date of reading the paper is unimportant.

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POPULAR AND ECONOMICAL ENTOMOLOGY.

WINTER COLLECTING.

BY JAMES FLETCHER, OTTAWA.

At the last annual meeting of the Entomological Society of Ontario, it was decided that every month there should be at least one short article upon the above subject. The Council consider it wiser not to increase the size of the CANADIAN ENTOMOLOGIST at the present time, but to take two pages from the space we now devote to Scientific Entomology. It is true the space at our disposal is all too small to accommodate the valuable articles sent in by our friends, but the demands are so frequent for articles of the nature mentioned, that it has been decided to try the experiment of having them regularly, and it is thus hoped to largely extend the influence of the Society by inducing more lovers of nature to take up Entomology as a study, and by providing agriculturists and horticulturists with short and simple accounts of their insect enemies and the latest discovered remedies. It has been suggested that the winter is an inappropriate time of the year to begin such a series of articles; but upon slight consideration this will be found to be not at all the case. In the continuous chain of nature, great interest will be found at every link and thing unexpected, strange and of marvellous beauty will appear at every point. Even in Canada, snow and ice-bound for so many months in the year, there is much collecting which can be done in the winter. A favorite occupation of the writer is to go off collecting with a congenial companion upon snow-shoes. The charm of this pleasant exercise in which, supported by the light snow-shoes, one can visit places inaccessible during the summer, is in no way diminished by being able to take home with you specimens which will afford ample occupation for many evenings. Starting off in a straight line many objects of interest are met with as we go along, across field and fences, through woods and swamps and over rivers, hills or even mountains, all levelled and smoothed down to an even surface by their thick covering of ice and snow. In passing through the woods and swamps cocoons are eagerly looked for on the slender boughs of trees and shrubs. It is seldom that we are not rewarded with cocoons of the large Emperor moths. In crevices of bark and beneath moss, many hibernating insects are discovered of several orders. Larvæ of moths and chrysalids of butterflies, beetles and hemiptera. One of our annual trips is to a certain

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tree for the pretty little homopteron, which forms galls on the leaf of the hackberry (*Psylla Celtidis-mamma*, Riley), and which passes the winter in a torpid state beneath the scales of the bark of the hackberry, the color of which it closely resembles. In passing through the swamps, tufts of moss are pulled from any exposed hummocks to be picked to pieces at home when they have thawed out. Here will be found many treasures which we have not found in any other way. Every cluster of leaves adhering to a deciduous tree or swelling upon a stem has to be examined for the cause, and if it prove to be the work of insects, must be put into the bag for examination. The only apparatus necessary for these expeditions is a bag slung over the shoulders and a stick with a hook on one end and a spike on the other; the bag acts as a large pocket, and saves the inconvenience of unbottoning your coat, when, perhaps, the thermometer is below zero. The hook on the stick is useful for pulling down boughs or pulling yourself out of a hole; the spike for prying off pieces of bark or digging into old stumps.

Objects of great interest, some of which can be better collected, and from which the insects can be more successfully bred when collected in the winter time, are the various kinds of plant galls. These require little trouble, all that is necessary is to put them away in glass jars and keep them closed. After a time the occupants begin to emerge, and to the surprise of the uninitiated, although each kind is made by only one kind of insect, from the galls will be produced perhaps half a dozen distinct species. These are most of them parasites upon the gall-maker, or what are known as inquilines or guest flies. The gall-maker produces the gall upon the plants. In this gall some of these guest flies deposit their eggs, and the young grubs feed upon the substance of the gall, or others again live as parasites, either upon the grubs of the gall-makers or their guests. Watching these as they emerge and making notes upon them, will be found most entertaining at a time of the year when there is little active life out of doors. A further zest is added to this department of study from the fact that so little has been done in this line, that many of the flies so bred will be new to science.

Other places which may be visited in the winter, are groves of evergreens where much will be found to repay the collector. Amongst the leaves of the pines are cases of larvæ, and in the leaves themselves are the burrows of the caterpillar of a tiny moth. Beneath the bark are numerous scolytid bark-borers, and from the solid wood beneath may be ex-

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tracted the large grubs of the timber borers; to obtain these last, however, an axe will be found necessary. In the garden the horticulturist will find plenty of work with which to occupy himself profitably. The egg masses of the tent caterpillars should now be collected and destroyed as well as those of the Tussock moths. Clusters of dead leaves should be removed from apple trees and their stems cleared of the scales of the oyster-shell bark louse and other small insects which winter in rough places on the bark or amongst the buds.

In addition to the above work out of doors, much is to be done during the winter to prepare for the work of the coming season. Apparatus and storing boxes for specimens should be prepared well beforehand, or, perhaps, when the time comes to use them, opportunities will be lost. Some simple elementary book should be procurred and read at leisure. In our library at London, we have for the use of our members, many books of this nature which can be borrowed by applying to the librarian. We should recommend to beginners Kirby & Spence's Entomology, Packard's Entomology for Beginners, and Comstock's Introduction to Entomology.

PHILIP HENRY GOSSE.

On Thursday the 23d of August, Philip Henry Gosse, departed this life at St. Marychurch, near Torquay, Devonshire. He was born at Worcester, on the 6th of April, 1810, and early displayed a taste for natural history. In 1827, he was engaged as clerk in the extensive mercantile house of Messrs. Slade, Elson, Harrison & Co., of Carbonear, Newfoundland. In June, 1835, he removed with his friend, Mr. G. E. Jacques, (now living at Cowansville, P. Q.,) to Lower Canada. He bought a farm one mile east from Waterville, on the River Coaticook. During the summer he cultivated his land, and in the winter he taught the Compton village school. At this time he collected the materials for his first work, the *Canadian Naturalist.* The rough life of a Canadian farmer, in a comparatively new settlement, was ill-suited to this young man of refined tastes; and the "noisy politics" and "martial alarms" of the times must have jarred on his ear, attuned as it was to the music of nature. Then, too, the people of the neighborhood were not of a class to appreciate his studies. They were wont to speak of him as "that crazy Englishman

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who goes about picking up bugs." It was well for him that as a naturalist, to use his own words, he could find "gratification in any scene and at any season," and that in Mr. Jacques, in whose house he boarded, he had a congenial friend. In Chapter viii. of his work, he draws a gloomy picture of an Eastern Township farmer's life; but in the preface (which breathes the modesty and piety which characterized him through life), he says:— "During a residence of some years in the Lower Province, the author has felt it to be no common privilege to be able to solace himself by these simple but enchanting studies * * * and even now the recollection of those pleasant scenes sheds forth a lustre which gilds the edge of many a dark cloud."

In March, 1838, Mr. Gosse left Compton, and settled in Alabama for about six months. His observations at this period afforded the subject matter of his *Letters from Alabama, chiefly relating to Natural History.* He returned to England in the spring of 1839, and published the *Canadian Naturalist* during the summer. On the 10th of August, 1844, he sailed for Jamaica, to study the natural history of that island. After a residence there of two years, he went back to England, and published the result of his investigations, under the title of *The Birds of Jamaica, A Naturalist's Sojourn in Jamaica,* and *An Atlas of Illustrations.*

From January, 1852, to the time of his death, Mr. Gosse's residence was at St. Marychurch, where he had a delightful residence which he named "Sandhurst." Attached to this were extensive conservatories, including a vinery, fernery, orchid houses, etc.

For some years, he was engaged in preparing works for the S. P. C. K. After that he devoted himself to the microscopic study of the British Rotifera. In 1856, he was elected a Fellow of the Royal Society. He was an indefatigable worker, usually in his study by four o'clock in the morning in the summer, and by six o'clock in the winter, and producing on the average two works in the year. His books must number about forty; and among the scientific papers of the Royal Society upwards of fifty are from the pen of Mr. Gosse.

Among his works are:—*Tenby, A Sea-side Holiday; The Aquarium; Actinologia Britannica; A History of the British Sea Anemones and Corals; The Wonders of the Great Deep; The Romance of Natural History; Life in its Lower, Intermediate, and Higher Forms; Land and Sea,* and *A Year at the Shore.*

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Always of a religious turn of mind, he delighted in sacred history and Biblical studies; and a number of words of a sacred and historical character proceeded from his pen. The last of these, published in 1884, was entitled, *The Mysteries of God, a Series of Expositions of Holy Scripture.*

One cannot often point to a life more pleasantly and usefully spent than that of Philip Henry Gosse.

THOMAS W. FYLES.

CORRESPONDENCE.

DANAIS ARCHIPPUS.

Dear Sir: I send you my season's observations on the movements of *D. archippus* in this locality. The spring of '88 was an unusually backward one here, cool, dry weather prevailing, which will, of course, affect all the dates more or less. I commenced by watching for the appearence of milk-weed *Asclepias cornutus* in two places where it grows in abundance; one, a flat to the west of the city, protected on the east and north by a high bank; the other to the east along the foot of the Niagara escarpment, a very warm spot when the wind is not north-east. On the 4th of June, I could not see a sign of its coming through the ground; on the 5th, I went to the country, about 26 miles north of this; they had more rain there, and *A. cornutus* was from three to six inches high; on the 7th, I saw my first *D. archippus* of the season, but they did not appear in any great numbers whilst I remained. On my return, I visited the west end on the 26th, there were a few flying about the weed, which was then from ten to fourteen inches in height with blossom clusters not yet expanded. I captured three—two males and a female, and saw a larva about one inch long and as thick as a wheat straw. In the same locality, on 3rd of July, I counted seven on the wing at one time, flying vigorously, and took two males, and felt sure from their movements the others were the same. On the 5th went east, milk-weed in full bloom, *archippus* abundant; captured two males, and suspected all the others to be the same; could find no larvæ; took fresh hatched *Milberti* and saw plenty of fresh *Atalanta.* Went west on the 7th, not many on the wing, and could find very few larvæ. Was at Guelph for ten days on the 16th, and visited the Agricultural College. Prof. Panton showed me chrysalids reared in confinement.

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On the 21st, at the west end, captured a freshly hatched male; found no larvæ; leaves of weed showing little signs of being eaten. 25th, same place; butterflies plentiful; freshly hatched mingling with old broken ones; took a fresh female. East on the 27th; butterflies not plentiful; saw a few larvæ nearly full fed. 28th, west; not so plentiful as on the 25th. From the 2nd to the 18th of August, I was in the vicinity of Brantford—25 miles west from Hamilton; there were few *D. archippus* to be seen, but all were fresh; yet there was an abundance of *asclepias*. On the 20th, was at the west end; larvæ scarce; saw one not half an inch long; took one full fed, which suspended that night, and pupated the following night; there were very few *archippus* about the milk-weeds, which were now four and a-half and five feet high. From the 1st to the 17th of September I was 16 miles south of here; there I saw several fresh *archippus*, but not a single stalk of *asclepias*. On the 21st was at the west end; *archippus* had completely deserted the milk-weed; I saw some feeding in a garden some distance away. My impression has been for a good while that the butterflies care but little for the milk-weed to feed at; that they are there for breeding purposes principally; that they are but light feeders, with a great fondness for loitering in open woods, where there is apparently nothing for them to feed on. My last observation was made on the 15th of October; the milk-weeds were still green at top, but the lower leaves were all decayed. I have seen no butterflies since the 21st of September. J. ALSTON MOFFAT, Hamilton.

SOME COLEOPTERA NEW TO COLORADO.

Dear Sir: Dr. John Hamilton has been good enough recently to examine some Coleoptera which I collected in Custer County, Col., and among them he finds five specimens new to the State List. One, *Ditylus obscurus*, was obtained in the eastern portion of the county, the other four are from near Swift Creek, at 8,000 to 8,500 feet altitude, and are as follows: *Aphodius brevicollis*—which Dr. Hamilton says was previously known only by a single specimen found in Nebraska; *Hister Harrisii*, Kirby; *H. subopacus*, Lec.—three specimens obtained; and *Lebia vivida*, Bates. Among my beetles from Eastern Custer Co. was also an example of *Pityophagus verticalis*, which Dr. Hamilton says was previously known by a single specimen only.

Sept. 7th, 1888. T. D. A. COCKERELL, West Cliff, Colorado

Mailed January 4th.

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The Canadian Entomologist.

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THE LEPIDOPTEROUS FAUNÆ OF EUROPE AND NORTH AMERICA.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

The study of representative species of butterflies and moths shows us that very different grades of resemblance exist between allied forms inhabiting Europe and North America. I have shown that the modification shows itself sometimes mainly in the larval state; again the perfect insects depart more or less strongly. I have also ventured to decide that these representative species are entitled to specific rank in our nomenclature. They fulfil the condition of species, since they do not intergrade, and they can be distinguished quite surely by competent specialists. The study of these representative species leads to the question of their relation, and we have seen that they may be regarded as survivals of a former northern, circumpolar fauna, which was broken up and driven southwards by the Ice Period of geologists. I have originally tried to show, in Silliman's Journal, that we have in our Lepidopterous fauna different elements. The representative species belong to this ancient circumpolar fauna. And here belong in part the identical species like *Vanessa antiopa* or *atlanta*. The identical species have remained unaltered, but certain species have been introduced by commerce, as the White Cabbage Butterfly and perhaps the Currant Borer, *Sesia tipuliformis*. The certain separation of these two sources of North American species belonging to the circumpolar element requires historical data which will hardly be forthcoming. The second element is that which comes to us from the south, a return wave of the migration southwards, which set in on the advent of the Glacial Age. This southern element is divisible into such forms as have already firm foothold, and such as the physical phenomena of the Gulf Stream, the prevailing air currents during the summer, land as wind-visitors upon our shores. *Erebus*, *Aletia*, *Euthisanotia*, among the moths, are more or less

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partial breeders in our territory. How far north the permanent residence of the Cotton Moth obtains is not yet known. I am the first to point out that it is winter-killed over much of the territory which its summer migrations cover as a moth. I have seen how the migration takes place. The moths crawled out in numbers on my plantation during one or two days, and I anticipated a third and more destructive brood of caterpillars. The next morning not one perfect moth was to be seen. On the ground crawled a few cripples with unexpanded wings, to be killed by the sun and the ants. There was no third brood; the moths had migrated, been swept by the winds to the north during the night. I have alluded to the influence of the winds upon the time of arrival of the Cotton Moth on the Atlantic coast.

The "original" part of my work on the Cotton Worm was my discovery that it hibernated in the moth state; that it was winter-killed over a part of the territory it occupied both as larva and moth during the summer; that in the south it had no other food plant than cotton. I accounted for the moths in Canada in the fall by considering them wind-migrants. No alternative food plant is known in the north. In the south, as I originally stated, the worms migrate from eaten-out cotton fields, leaving the weeds and vines untouched, in search of fresh cotton. I identified the insect with the South American *Aletia argillacea* of Hübner, and stated my theory which I arrived at from a study of the habits of the moth and from a knowledge of the cotton plant itself, which like its parasite is not indigenous with us. Both have changed their normal condition. Man brought the cotton plant, which under culture and in our climate has become an annual, itself winter-killed in part, but so more productive of cotton; the winds brought the moth and the cultivated cotton fields supplied abundant food. I pointed out the yearly seasonal spread of the moth from south to north.

But to leave the special subject of the Cotton Worm, which is interesting by itself as illustrating one of the sources of the southern element in our Lepidopterous fauna, and to proceed with our analysis. The third element in our fauna is that which is North American *per se*, that is, which is descended from a pre-Glacial North American fauna, or which has become so modified from its original source as to be classed as North American. Here is a very difficult study in a consideration of the characters of our Lepidoptera. I have taken *Cressonia juglandis* as a

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type of a North American moth descended from a pre-Glacial North American ancestor. I have taken *Datana* as an example of a North American moth which has become so modified from its original source as a member of the ancient circumpolar fauna, the first element in our present North American fauna, as to be now classed as North American. In the same group I take *Apatelodes* as an example of a North American moth which has become so modified from its original source as a member of the tropical, or South American fauna, as to be now classed as North American. The *Ceratocampinæ*, the genus *Hyperchiria*, I regard as ultimately of Southern origin. The genus *Catocala* belongs to the first element in our fauna; it is a development from a former circumpolar fauna.

But not to go further for the moment in this direction, let us compare the American and European butterflies and moths in a more general way, so as to arrive at some conclusion with regard to the departure from a common type in the members of the circumpolar fauna. The first thing which strikes us is the comparatively greater tendency to variation, to splitting into species which characterizes the North American butterflies and moths. Take the genus *Colias*, which belongs to the first element in our fauna; how it wanders into distinct forms, sometimes still connected, again no longer now members of the same reproductive cycle. Without Mr. W. H. Edwards's observations on the larva, we should be quite at sea.

But now, compare our protean *Colias* species with the two set European forms! What is true of *Colias* is true in other genera. Take the genus *Datana* among the moths; this is an American out-growth of the European *Phalera*. Now in Europe there are two closely allied forms of *Phalera*, *bucephala* and *bucephaloides*, but they are to be at once picked out by a slight but constant difference. In America we have six or seven species of *Datana*, and, if we take out *Angusii* and *perspicua*, as being distinguishable by general colour, all very near and difficult to distinguish as moths. In the genus *Clisiocampa*, the same phenomena are repeated. See how variable the underwings are and how much difference of opinion exists among writers! I am of opinion that *Catocala residua* is a good species, but Mr. Hulst is not with me here. At the best we can say, that Mr. Hulst, in regard to other species and varieties (e. g. *præclara*, *herodias*, *gisela*), has corrected himself and adopted my views, and that he will also probably come in time to agree with me in regard to *Alabamæ*,

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Whitneyi and *residua*. We have seen, that the more correct determination of the moths alone is a matter of scientific experience, inborn feeling, in short of tact which comes alike from long work and genius for the study. The check to all such determinations of the perfect insects is breeding from the egg.

In the North American fauna, we also have the European genus *Scopelosoma*; in Europe with one constant form, in North America with several closely allied. How thankful I am, that Mr. Thaxter has bred our closely allied species, so that no opinion formed from the imagines alone is now worth having or recording.

As the result of our comparison, we see the fact that species tend more to vary, to wander off into new forms in North America; whereas, in Europe, they have a greater setness, or fixity in their appearance. It would seem as if the faunal changes in America had been greater, influenced by physical causes, the chain of longitudinal mountains, the land connection of the tropics, the course of the winds of the gulf stream, all the phenomena of climate and temperature. The probability is, that the European species are nearer the old circumpolar pre-glacial forms; that in most cases the North American forms have made the variation, the step in a new direction.

Species by species, genus by genus, must these comparisons be made, so that we may unroll the probable past of our butterflies and moths. The life-histories must be known and compared. Work like that done by Mr. W. H. Edwards, Mr. Thaxter, Prof. French, Mr. Beutenmüller and others must be encouraged. Some papers by Mr. Moffat, on the question of species and variety naming, recommended themselves to me greatly. At the risk of repeating myself, I maintain that, as an entomologist, we are here to discriminate, not to lump; our work is to talk about and illustrate the differences we find in insects.

An intelligent resolving of the study into its different phases is much needed. While with patience, the fine work of discriminating the forms is being carried on, the labour of comparisons, for the purpose of aiding the solution of wider questions, should not be neglected. There is enough to do, and I am glad to see, as the years go by and fresh workers come into our field, that there will be enough to do it. It is the pursuit of truth that is always new and interesting.

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A NEW SPECIES OF NEONYMPHA.

BY G. H. FRENCH, CARBONDALE, ILL.

Neonympha Mitchellii n. sp.

Expanse of wings, male, 1.20 to 1.30 inches; female inches.

Male.—Upper surface grayish wood-brown, rather dark, without spots or marks, except that the spots on the underside of the hind wings and the dark lines bordering the terminal dark yellow line on the same wings show through a little. Fringes concolorous, in certain lights a little smoky tinged. Under surface slightly paler than the upper, a little more of the mouse order of color, sprinkled with buff scales. Both wings are crossed by four transverse brownish-yellow stripes, so dark on the fore wings as to be yellow-brown, occupying the same position as the same lines in its ally, *N. Areolatus*, the first and second uniting by a rounded end about a tenth of an inch from the inner margin of hind wings, the two outer—one terminal and the other sub-terminal—also uniting before reaching anal angle. In *Areolatus* these lines do not unite. Each of these lines has a dark brown (more or less distinct) fine bordering line on each side of it. The first line crosses the fore wings a little more than two-thirds the distance from the base of wing to end of cell, the hind wings about two-thirds. The second line crosses fore wing a little beyond the end of cell, the hind wings across the end of cell. The second and third are approximate anteriorily as in *Areolatus*. Fore wings with a row of four small ocelli between second and third lines, black, circled with pale Naples yellow or buff, the first varying from a dot, the size of an ordinary period, to about twice that diameter; in four examples circular, in two a little oval, in two a silvery metallic centre, the second a little more than twice the diameter of the first; in three examples circular, the other three slightly ovate, each with from one to three metallic points, when three present in the form of a triangle; the third averaging the size of the second, circular, with from one to two metallic points, when one central, when two in line with the row of spots; the fourth about one-fourth larger than the first, circular, all but one, which has the buff circle almost complete on the outside, but also a few buff scales outside the circle, a single metallic point to each of these.

Hind wings with six ocelli to each wing, circled with buff as those on

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the fore wings. The first varying from a few buff scales, in one example, without the black centre, to twice or thrice the diameter of an ordinary period, circular, the largest with, in one example, a silvery metallic point; the second about .04 of an inch in diameter (the black portion), circular in four examples, in two a slight bulging in outer anal part, from one to five metallic scales, aggregated or scattered; the third from .06 to .07 of an inch in diameter, all nearly or quite circular, two silvery metallic points, in line with the ocelli; the fourth size of the third and the same shape. In each of these one example has a few black scales projecting into the buff annulus externally on one wing, points as in the third, except that in one the metallic scales are scattered on one wing; fifth of the size of the third, circular, in one example a few buff scales invade the black externally on one wing, in two other examples they are a little irregular in shape externally on both wings, two metallic points to each, with a few scattering scales in two examples; sixth about constant in size, as large as the largest of the first, one metallic point in all but one, ocellus, where the scales scatter a little, circular.

Body concolorous; antennæ above on basal two-thirds colour of wings, terminal orange shading into basal colour; beneath whitish, outer third orange; sides of basal two-thirds brown and whitish.

Female.—Differs from the male in being paler both above and below, and slightly in the arrangement of the transverse lines on the under side. In two of the four before me, the second and third lines distinctly unite with each other near the anal angle, while the lines by which the first and second, and the third and fourth unite are to be seen but are obscure. In one of the others there is no union between the second and third, while there is plain union between first and second, and third and fourth. The fourth has a distinct union between the first and second, and third and fourth, but the rounded ends of these unions touch. Both wings of the same example alike in this character. Ocelli as in the males, with about the same amount of variation.

This species differs from *A. Areolatus* in the following points:—In *Areolatus* the fore wing may have three ocelli and vary from that to many, while the hind wings have five. In *Mitchellii* four are always found on the under side of the fore wings, and six on hind wings in both sexes. In *Areolatus* the ocelli are elongate, the long part the long way of the wing. In *Mitchellii* they are all circular with only a little variation.

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In *Areolatus* the metallic points in the ocelli are pale blue, and are arranged more or less in rows in the ocelli lengthwise of the wing. In *Mitchellii* they are, if in rows at all, across the wing. In *Areolatus* the transverse lines on the under side are ferruginous, and the second and third always unite near anal angle of hind wings. In *Mitchellii* they are more of a brownish-yellow; in the males the second and third lines never unite, but the first and second, and the third and fourth always unite leaving a little space between their rounded ends; in the females only one out of four had the second and third distinctly united. In *Areolatus* the metallic points are pale blue. In *Mitchellii* they are lighter, being more of a silvery colour, giving none of the real blue reflection, unless seen at a very oblique light, and then very pale.

Described from six males and four females taken by my friend, Professor J. N. Mitchell, in Cass County, Michigan, to whom I dedi cate the species. They were found in upland dry meadows, about ten miles from the Indiana line. Professor Mitchell is of the opinion that the species has been found as far north as Kent County, Michigan.

TWO NEW SPECIES OF TINEIDÆ FROM THE ALEUTIAN ISLANDS.

BY WM. BEUTENMULLER, NEW YORK.

Cerostoma Aleutianella, n. sp.

Head and palpi olive gray; legs olive gray, tibiæ annulated with fuscous; body fuscous. Primaries olive gray, becoming paler toward the outer margin; above the fold is a broken fuscous basal streak, running to a little beyond the middle of the wing; at the end of the cell a small fuscous spot, limited beneath by a white patch. Cilia olive gray. Secondaries grayish fuscous. Underside of wings grayish fuscous. Cilia of the primaries tipped with greenish gray.

Expanse 20 mm. 1 ♂. Coll., Hy. Edw.

Cerostoma Dubiosella, n. sp.

Head, thorax and palpi fuscous. Primaries grayish fuscous, thickly covered with deep fuscous scales; before the outer margin a few white and black scales. Secondaries grayish fuscous, as are also the underside of the wings.

Expanse 18 mm. One example. Coll. Hy. Edw.

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NOTES ON BOMBYCIDÆ.

BY FREDERICK CLARKSON, NEW YORK.

The habits of insects present an attractive and fruitful field of discovery, illustrating in many remarkable ways their peculiar instincts governed by heredity, and more or less conditioned by environment. The power which we call instinct, controlling the habits of insects, has a regularity of action governed by ordinary conditions, but there are frequent manifestations of adaptation to circumstance, as conspicuous in the several orders of insects as in the various races of mankind. The extraordinary condition can only be regarded as an obstruction to the usual law that governs instinct, and compels the creature to conform to the changed surroundings. The larvæ of *Bombyx mori* if crowded for space at the time of pupation will associate to the number of three or four in spinning the one cocoon which covers them. The larvæ of *Samia cynthia* under like environment present a similar variation of habit by spinning interior sections one above the other in the silk-lined leaf constituting the one envelope, so that outwardly it has the appearance of a long, single cocoon. The marked feature of this dual cocoon is, that while ordinarily the place of escape for the imago is at the upper end of the cocoon, the inhabitant of the lower section emerges at the lower end of the cocoon, from the lower end of its section. The *Cynthia* worms occasionally, from like necessity, will, to the number of two, spin a cocoon in common and undergo transformation in the one interior section. I have collected the past season very diminutive cocoons of *P. cecropia* and *S. cynthia*, the former measuring one and one-half inches long by one-half inch in diameter; the interior section three-quarters of an inch long by three-eighths of an inch in diameter; the latter was spun on a leaf one and one-half inches long, the cocoon rather less by three-eighths of an inch in diameter. The cocoons contained the larva dead and in a dried condition.

From a cocoon of *P. cecropia* I have obtained a very small male, measuring scarcely four inches in expanse of wing. The kidney-shaped spots on secondaries are reversed from their usual position, the pointed end being directed towards the abdominal or inner margin, instead of as commonly to the exterior margin. The wavy white line, bordered with black, on the exterior margin of the primaries, which is usually more or less pointed into the adjoining lilac, is in this specimen a line corresponding in form with that of the margin of the wing.

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NOTES ON COLEOPTERA.—No. 5.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Cicindela. A glance over the catalogue shows many names marked as varieties of others, and a glance into the boxes of any fair collection shows these same to have a diversity of appearance, that in many instances requires an educated experience to reconcile with their being specifically identical; as for example, a green *C. sex-guttata* and a black *consentanea*, or an immaculate green *unicolor* and a black *modesta*. With systematists, size, color and markings have no primary weight in specific identity; that is, when the species are not *made*. It is not here purposed to enter on the relation of races, the determining causes of which are beyond reasonable conjecture and must have been indefinitely remote, since hereditary reversion to a common ancestral type is obsolete, and many varieties breed true to themselves without producing any of the others; but, to protest against the practice some collectors have of ignoring varieties in making exchanges, as sending *vulturina* or *prasina* instead of *obsoleta;* and to advise that they be treated as species. Indeed it is quite possible when their internal anatomy is better known and structures like the sexual organs studied and used in systematic work, as has been done by Dr. Horn in *Corphyra*, some of these varieties may turn out to be species. I take var. *consentanea* and var. *modesta* abundantly in the pine woods of New Jersey near the coast, basking in the sunshine on the white sand, but neither *sex-guttata*, nor *scutellaris*, nor any intervening varieties are found near there, and I doubt greatly whether the opposite sexes would recognize relationship or produce fertile offspring. *C. repanda* and var. *12-guttata* are found in great plenty here and do not appear to mingle, each race confining itself to its own territory—the former to the river shore and benches, the latter to the rocky creeks and adjacent plateaus—and are not known to hybridize or in any way acknowledge kinship. The above recommendation is intended to apply to the other families of Coleoptera as well as to Cicindela, and it is believed every race that is distinct should have a name for the convenience of collectors, if for no other purpose.

Dyschirius. The following, with the other named beetles, were taken Aug. 27th, on Brigantine Island, N. J., in a salt marsh on a sandy spot about three feet by two and elevated some six inches above the level of

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the ordinary tides: *D. sphæricollis*, 7 sp.; *D. pallipennis*, 2 sp.; *D. filiformis*, 1 sp.; *D. pumilus*, 10 sp.; *Clivina striatopunctata*, 5 sp.; *Bledius politus*, 16 sp.; *B. basalis*, 20 sp.; *Trogophlœus?* sp., 12 spec.; *Rhyssematus scaber*, 18 sp.; many *Bledius maxillosus* around the base were not collected. The *Dyschirius*, *Clivina* and *Bledius* burrow only deep enough in the moist sand to fairly cover themselves, and their presence is known by the little mounds at the entrance of their excavations. In life the elytra of *Bledius basalis* are pearly white, with the basal declivity black; those of *B. politus* are reddish-yellow and shining, and the thorax is ferruginous, and it may be known from all others of its size by the deep thoracic channel and the sparse coarse punctuation of the thorax and elytra; the head of the male is large, and tuberculate between the ocular ridges; both species extend southward along the coast to Florida. *Rhyssematus scaber* does not burrow, but lives beneath a thin layer of a confervoid growth that forms on the marshes and about the roots of grass. This little beetle feigns death so persistently that I never saw one move in the least, and the only other Aphodide I know of that has this habit is *Dialytes striatulus*.

Lebia vivida Bates. A specimen of this beautiful little beetle, described from Mexico and introduced into our catalogue on the strength of two specimens taken in Arizona, is in my collection through the kindness of Mr. T. D. A. Cockerell, taken by him in Custer Co., Col., at an elevation of some 8,000 feet, thus showing that it belongs to the fauna of the Rocky Mountains.

Cychrus Lecontei Dej. Most of the Carabidæ have a regular time of appearance, but this does not seem to be the case with *Lecontei*, bright new specimens of which may be found from April to December. I have found them paired in November, in April, and at various times during the summer. It hibernates, as is well known, in logs and under moss and stones.

Chlænius Pennsylvanicus Say is subject to considerable variation in color, size and sculpture, but nothing is seemingly stable enough to form a race or true variety. One of these variations I was once disposed to regard as a species till set right by Dr. Horn. It has pale epipleura, and the side margins of the ventral segments rufous, like *Circumcinctus;* the outer three intervals of the elytra are dark green, contrasting with the the dark disk. It occurs here in summer on the river beach, and I have

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not seen it inland. I have specimens of it from Missouri, New York and Canada labelled in error, *tricolor*.

Harpalus vulpeculus Say appears late in the season, and then the thorax is rufous, but becomes black in some individuals after hibernating. This tendency to *melanism* has not been observed in *H. dichrous*, which occurs with it, and has likewise a rufous thorax. *Stenolophus conjunctus* appears in summer and autumn, and then its thorax is rufous; in the fall it becomes gregarious, and winters under rails and stones in grassy places, after which the thorax is entirely black.

Tachycellus Kirbyi Horn is not met with every day, as it lives in grassy places in boggy swamps in their natural state, mostly inaccessible except in the dry part of the season. It is usually found about the roots of tufts of grass. A good way to take swamp beetles is to spread an armful of cut grass over some wet, bare place in the swamp, and on turning it over every three or four days some otherwise rare insects may be taken, as *Pterostichus patruelis*, which here inhabits swamps. Along with it is found plentifully a common species of *Stenolophus*, yet undescribed, that goes in with *ochropezus* or *plebeius*, as the collector fancies.

Pocadius helvolus Er. Whoever desires this beetle may take it during August in a growing *Licoperdon*, which when ripe is commonly known as puff-ball. A dozen or more are often taken in a single one, and are of all colors from ferruginous to nearly black; but young puff-balls are not always plentyful, and when found not more than one in twenty contains beetles, which need not be greatly regretted by the collector if he is anything of an epicure.

Pityophagus verticalis Horn was described from a single specimen from Colorado, the absence in which of the small spinules on the external edge of the tibiæ seen in the other species was attributed to probable abrasion. From Mr. T. D. A. Cockerell I have received from Custer County, in the same State, an apparently perfect specimen in which there is no trace of these spinules. This character, when more specimens of this and *rufipennis* occur, may, apart from color, have chiefly to be depended on to separate the species, as from the specimens before me it is doubtful whether the cephalic characters will do it in all cases. In this specimen of *verticalis* the vertical fovea is rather an elongate impression with a fine line extending on the occiput. In three specimens of *rufipennis* from California the fine occipital line is absent in two and only discernible

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in the third, but well marked in one from Oregon; while in one specimen there is a very obvious frontal impression, much like that in this *verticalis*. In both species the head is transversely impressed posteriorly, and the pygidium concave with a much raised hind border.

Aphodius marginatus Lec. This fine species was described from a unique, and by Dr. Horn in his monograph, from the type and another specimen, both from eastern Nevada, and supposed to be females. Through the favor of Mr. Cockerell, who collects in Custer County, Col., at elevations of from 6,000 to 8,000 feet and upward, I have a specimen that appears to be a male. It differs from the type by having the front distinctly tri-tuberculate, and a fine basal thoracic marginal line evident at the middle, but obsolete near the sides; the punctulation of the thorax and elytral intervals is exceedingly fine, and cannot be seen by the unaided eye; there are large coarse punctures disposed in clusters along the sides and base of the thorax, but absent from a large triangular space on the disk with its apex posterior; also a depression or concavity at the front as well as the hind angles.

Ligyrus relictus Say. Walking on the river beach in August, I turned over a shingle on a small sandy place about which some grass was growing, under it were seven *Harpalus caliginosus*, and the elytra and other remains of several *L. relictus* which they had devoured. Noticing the sand to have been much disturbed I dug down and soon turned out twenty-seven of the beetles named, which were buried from two to four inches deep over an area of about ten by sixteen inches, and of both sexes. Other similar spots were investigated without results. Now is this a known and common habit? What is its purpose in the economy of the insect? Did the *Harpalus* kill those they feasted upon? *L. relictus*, also *Chalepus trachypygus* and an occasional *Polymœchus brevipes* come to the electric lights in the city, but *relictus* flies also by day in the warmest sunshine, especially along the river.

Leptura haematites Newm., *nana* Newm., *exigua* Newm., *saucia* Lec., *subargentata* Kirby, *similis* Kirby, *ruficeps* Lec., and *rhodopus* Lec. These names have long been a source of perplexity to collectors and of no little confusion. Dr. Horn (*Entomol. American* i., 8) recognizes only three species, *haematites*, *exigna* and *subargentata*, placing five others in synonymy—*nana* and *saucia* with *exigna*, and *rhodopus*, *ruficeps* and *similis* with *subargentata*. This leaves a very common species here and

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northward through Canada without a name. *L. haematites*, with its red thorax, is well known, occurring abundantly on *Cratægus* and other blossoms in the spring. Its sexual differences consist in the thorax of the male being much longer than that of the female, and anteriorly narrowed The unnamed species is similar in size (.18 to .22 inch in length), and has the same sexual characters, but the thorax and elytra are concolorous, being black, or brownish black, with cinereous pubescence. These two species are frequently taken together, and were the thorax of the same color could not be separated by any character yet discovered. I have the unnamed species from New York, Canada and elsewhere labelled *subargentata*, or *similis*, according to the color of the feet. *L. subargentata* is, however, a very different insect, though having the same sexual characters. It is much larger (.26 to .30 inch in length), blacker, more coarsely punctured and sparsely pubescent, occurring more commonly in northern Canada and the Rocky Mountain region to Mexico. In all these species the legs vary from black to rufous, and the colour is of no value. *L. exigua* does not belong to this group, having different sexual characters; the male has the last ventral segment convex at middle and impressed at tip, and in front of the impression a mucronate tubercle projected backwards; this, and the black spot on the thorax surrounded by golden pubescence, easily separate it (L. .24 inch). The unnamed species is probably in most collections by some name.

Leptura Zebra Oliv. July 6th. Several females taken ovipositing on a white oak stump made the preceding spring.

Agasphærops nigra Horn. Among a number of Rhyncophora from Vancouver Island, B. C., from Rev. Geo. W. Taylor, there was a specimen of this singular insect, so like *Otiorhynchus sulcatus* that I passed it by as such till the unknown forms were examined. The genus and species were founded on two specimens taken at Mendocino, Cal. This specimen differs a little from the types being a little larger (.34 inch); the tubercles on the thorax are not very close, each being about the size of a No. 2 to 3 Klæger pin head, flattened on the top, and bearing a deep puncture; the elytral intervals are composed of single rows of tubercles equally as large and similarly punctured. On the thorax and elytra there is a pattern of white and golden scales similar to that seen in *Hormorus undulatus*, but they are sparser and less conspicuous; these scales are easily rubbed off, which may have been the case with the types before they were seen,

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otherwise this might be regarded as a second species. The beak is sulcate like *Otiorhynchus sulcatus*, but twice the length, and the scape of the antennæ scarcely reaches the eye. The elytral ornamentation of *sulcatus* is less noticeable and more pubescent like, and none of the tubercles of the thorax and elytra, which are much smaller, are perforate, those of the intervals being arranged in irregular clusters.

Conotrachelus naso Lec. I am not aware of a record of this species occurring in the Northern States. Last year and also the present I bred it from the fruit of *cratægus*—haws—as well as *C. posticatus*. The species are very close and are best separated by the two yellowish white spots on the thorax of *naso*. *C. cratægi* is, however, the great haw worm next to the larvæ of the Lepidopterous *Grapholitha prunivora* Mels., which developes with, but a couple of weeks later, than the beetles.

DESCRIPTION OF THE LARVA OF DATANA MAJOR G. & R.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Young larva.—Body dark reddish, inclining to black; otherwise as in the following stage.

Before last moult.—Body black or reddish black, with eight longitudinal clear white stripes, as broad as the intervening spaces or broader, with the exception of the dorsal space. Beneath are three partly obsolete white lines, two of them interrupted by the legs. The head and cervical shield all dark mahogany red, as are also the abdominal feet, the bases of the thoracic feet and two spots on segments 4, 5, 10 and 11. Thoracic feet black. The anal plates are black or dark mahogany red; sparsely distributed white hairs. Length about 30 m.m.

Mature larva.—Body black; stripes broken into a series of irregularly square or rectangular white spots. In the three upper rows on each side these spots occur two on each segment situated near the edges of the segment. The lower row consists of a spot before the spiracle, alternating with an elongated one overlapping on two segments, so that these spots nearly alternate with those of the upper rows. Head, cervical shield, anal plates, all feet (except thoracic) with their bases and two spots on segments 4, 5, 10 and 11, dark mahogany red. Below are a few white dots representing the usual stripes. Scattered whitish hairs. Length about 60 m.m.

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There is a variety in which the stripes, and later the spots, are bright lemon yellow instead of white. The colour seems to be constant for an individual. The larvæ live together in rather small swarms, not exceeding fifty, till after the last moult, when they separate, often leaving the food-plant to ascend another in the vicinity. They then feed singly to maturity.

Food-plant, *Andromeda ligustrina*.

NOTES ON SOME CALIFORNIA MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Arctia Shastaensis Behrens, MS., nov. var. or nov. sp.

This new form was found by my friend, Mr. James Behrens, of San Francisco, at Upper Soda Springs, Siskiyou County, near Mount Shasta. The hind wings and abdomen are wanting, but the fore wings are present and in a very fair state of preservation. They are black, without light markings on the veins, but marked with yellow as follows:—A very broad transverse stripe, the basal of the usual three found in *A. Achaia* and *A. Behrii*, as wide as the female of *Behrii*, but more regular along its edges and curved more as this stripe is in *Achaia*, and not extending out on the costa as does this stripe in *Behrii;* the second of the three usual stripes is absent, save a few yellow scales on the sub-costal vein; the third is present, but narrow, arcuate, does not quite reach the costa, and only comes a little below the streak along median vein to posterior angle, a little attenuated at both ends; the usual longitudinal stripe below median vein, not reaching the base as this stripe does in both *Achaia* and *Behrii*, but beginning just inside the broad stripe, where it almost connects with an outward curved half line inside the broad stripe, that is broad on costa, but narrow below, outside the broad stripe the stripe is narrow, and on one wing broken before reaching posterior angle; the M-mark present much as in *Behrii*, beginning on costa midway between stripe three and apex, the first bar of the M curved inward, the other two outward and joined together and to the third stripe, the fourth bar absent as the spur that is usually sent out from the sub-median stripe is here absent. Fringes black; head, thorax and patagia black. Beneath as above, only paler. Legs black, except inside of anterior femora, which are yellowish.

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The basal half line and fringes being black with the broad basal stripe would point to this insect being a variety of *A. Behrii*, as also the black body parts, but the downward curving of the sub-median stripe before reaching posterior angle ally it to *Achaia;* unlike either of these, it has no yellow along the posterior margin.

Apatela Felina Grote.

Mr. Grote describes this insect in vol. 5, No. 2, page 208, of the Government Survey Bulletins, comparing it with its ally, *A. Lepusculina*. Having several bred specimens, I make here a few additions to Mr. Grote's description.

The fore wings are distinctly blueish-gray, and the marks are more obliterate than in the usual *Lepusculina*. The female has scarcely a trace of the sub-terminal line, even in whitish shading; but one male has the sub-terminal line nearly as distinct as in *Lepusculina*, like that interspace ally arcuate, but bending inward only about half as far on the second median interspace, and consequently the line is not so far from the outer margin, below this vein as in *Lepusculina*. The psi mark is less distinct. Reniform obsolete, except a curved mark, part of the inner or basal portion of the annulus. One male has on one wing almost a perfect orbicular but faint. It is elliptical, the long diameter parallel with costa and much narrower than the same in *Lepusculina*. Hind wings of male white, soiled terminally and along the veins; of female so much soiled as to be gray. The fringes of both wings concolorous, checkered with black.

CANADIAN COLEOPTERA.

The Council of the Entomological Society of Ontario has decided upon rearranging the Society's collection of Coleoptera according to Henshaw's List. This will necessitate the entire reprinting of the "List of Canadian Coleoptera," and as it is desirable that the new list should be as full and as correct as possible, our friends will confer a great favour by forwarding to the Secretary a list of all new names of Canadian beetles that they may have obtained by correct identification. As it is necessary that the list should be placed in the hands of the printers with as little delay as possible, our readers are desired to reply to this request at once. Henshaw's numbers will be printed on the new list, which will be for sale in sets when completed.

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MR. SMITH ON CERATHOSIA.

BY A. R. GROTE, A. M., BREMEN.

In reply to Mr. Smith's paper, somewhat inappropriately styled "*Arctiidæ vs. Noctuidæ*," I would state that my original paper in Entom. Amer. on *Cerathosia* had for its *main* object the pointing out of the errors contained in Mr. Smith's original description of the genus in the neuration. When these errors are corrected according to my statements (which latter in the main seem to be acknowledged by Mr. Smith as correct), the probability that the moth is an *Arctian* next to *Utetheisa* is weakened, and, as I have shown it is not a Lithosian, the chances are we must look for its position elsewhere. The *secondary* object of my paper was to suggest that we might find a better place for *Cerathosia* next to *Acopa*, etc., in the Noctuidæ. Now, in reply to Mr. Moeschler, and Mr. Smith, I have to say, that I did not discuss vein 8 of *Cerathosia*. I have also to complain that Mr. Smith is an unfair writer, who indulges in large expressions of condemnation upon small grounds (as for instance the fact that some Lithosians have an accessory cell, while I give no accessory cell as a character of the sub-family), and above all a writer who misrepresents the party he desires to criticize. Mr. Smith alludes to a paper on *Cerathosia* "not yet reached." I advise him when that paper is reached, to have any statement it may contain as to the neuration of *Cerathosia* corrected according to my original corrections. I have no objections to my writings being "handled without gloves," as Prof. Fernald says Mr. Smith does, when the criticism is fair and reasonable.

A FINAL WORD ABOUT THE GENUS RILEYA.

BY WM. H. ASHMEAD.

In the last issue of the CAN. ENT. Mr. Howard, with a commendable solicitude for my entomological reputation, and under a heavy discharge of deadly parallel columns, seeks to evade the question at issue between us, *i. e., who has priority in the use of the generic term Rileya;* and notwithstanding the opportunity was afforded him to rechristen his interesting genus, he seems loath to do so, and again, by a misrepresentation, makes a claim of priority in publication.

Had Mr. Howard written *read* instead of "published," he would have been nearer the truth. However, this may have been another *lapsus*

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pennæ. *His* published description first appeared in the October number of the CAN. ENT., nearly five months after the publication of "my synoptic tables," as previously pointed out by me, and the points claimed by him are without value.

In order to close a controversy that has already assumed an inconsistent warmth, I now propose for Mr. Howard's genus the name *Chrysoplatycerus*, and the species may in future be known as *Chrysoplatycerus splendens* Howard.

CORRESPONDENCE.

A FLOCK OF BUTTERFLIES.

Dear Sir: While in the interior of New Guinea, in Aug., 1883, I observed what might properly be called a flock of butterflies. They were apparently of one species* (of a dark brown color, with a blue reflection on the fore wings in a certain light), and in such great numbers as to actually blacken the green bushes on which they lit. I first came across them one day, while out after birds, in a thick and shaded part of the tall forest, in low land adjoining the Laloki river. Being so numerous, I supposed it would be an easy matter to catch all I desired without the aid of a net, but after several unsuccessful attempts, in which case they would rise in a cloud and settle again in a few moments on the bushes close at hand, I was obliged to give it up. They did not seem to be very much disturbed at my approach, but would not, however, allow me to get very near without taking flight. As soon as I remained still, they would immediately settle on bushes and foliage close by, but always out of reach. The flock was, perhaps, two acres in extent, but the butterflies were not equally numerous over this entire area. In some places every bush, branch, twig and leaf seemed to be covered with them, while in others there were comparatively few. What their object was, or how long they remained in that locality, I am unable to say, except that in visiting the place several days afterwards, they were still there in apparently undiminished numbers. I might add none were seen feeding, and, so far as I observed, there were no flowers in bloom anywhere in the vicinity.

S. W. DENTON, Wellesley, Mass.

* The name is unknown to me, but I have a specimen of this butterfly which, if returned, I will send to any person who is capable and willing to determine it.

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ARZAMA OBLIQUATA.

Dear Sir: The recent communications of Mr. Brehme and Mr. Moffat (CAN. ENT. xx.–119, 130, 180, 238), have revived my interest in the habits of *Arzama Obliquata*, G. and R. At the Minneapolis meeting Entomological Club A. A. A. S. (1883), the habits of the insect were discussed at some length, principally by Dr. Riley and myself. So much of the discussion as the Secretary considered worth printing, may be found in Vol. xv. of the CAN. ENT., pp. 171 and 174. The only difference worth noticing between us was in regard to whether there are two broods annually or one. It was finally agreed that both were correct—quite unusual in matters of this kind! In all probability, about Washington there are two, whilst in Western New York there is but one; if this be so, some of the apparent discrepancies of your correspondents may be cleared up. Mr. Brehme describes the egg, and Dr. Riley the masses of eggs (xv.-171). It would be of interest if Mr. Brehme would communicate the manner of occurrence of the eggs. I have not been so fortunate as to find these bodies, but have followed the quite young larvæ to maturity. I feel sure that it is single brooded in New York and Canada, and that the mature larva in the fall swims to land if necessary (see xv.-174), and crawls into loose earth, or preferably into old wood, or under rubbish where it remains until spring, transforming in May. I have ransacked *Typha* stalks at all seasons for borers, and do not remember to have found this larva, nor have I any notes stating that it was ever found as larva late in autumn or in spring within the stalks, or that it was found to transform in the same. Whatever the habits may be in New Jersey, or at Washington, I have evidence which confirms the correctness of Mr. Moffat's impressions of the habits of the species in his latitude.

Dec. 17, 1888. D. S. KELLICOTT, Columbus, Ohio.

PIERIS ILAIRE, GODT.

Dear Sir: I wish to record in your valuable journal the capture of *Pieris ilaire* Godt. at Lancaster, N. Y. The accidental occurrence of such southern forms at this northern locality has a certain interest which, I think, will warrant this notice. The present specimen was taken fluttering around a corn field on the 22nd of September, 1880. For about a

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week previously warm southerly winds had prevailed with little or no rain, followed by a light frost on the morning of the 21st. At first sight of the butterfly I recognized it as a stranger to our neighbourhood, and with care succeeded in capturing it without further injury, if indeed such were possible, as it was already a woeful looking object, the wings were torn and badly denuded, and the poor creature hardly had the strength to support itself the few yards it attempted to fly. For eight years I have kept this sorry looking treasure hoping some day to learn its name and history, and in this I have at last been successful. Poey gives a good figure of the female in his *Centurie des Lepidopteres de l'Ile de Cuba*, and it is well described by Boisduval in his *Species gen. des Lepidopteres*, vol. 1, p. 491. The present example is a large female with the black border of the wings unusually broad, which variation is mentioned by Boisduval. The most northern habitat that I can find is given in French's Butterflies of the Eastern United States, as "Indian River, Florida, Texas and Arizona," but I have had little opportunity for investigating the subject, and it may be a more common visitor in the north than I imagine. Prof. Grote, in his charming paper on the Geographical Distribution of the N. A. Lepidoptera, published in the eighteenth volume of this journal, has given us a very serviceable classification of the origin of the N. A. fauna. Probably *P. ilaire* pertains to the fourth table of his third category (p. 236), at least two of the species there enumerated appear to have been taken here, viz., *Thysania zenobia* and *Brotis vulneraria*. If, however, it breeds continuously in the Southern States, its association with *Erebus odora* in Grote's second table (p. 235) would seem more natural, and would render its occurrence here less surprising.

E. P. VAN DUZEE, Buffalo, N. Y.

The second paper on "Popular and Economic Entomology," which was promised for this number, has been prepared by Mr. Fletcher, but owing to the cuts required for its illustration being in the hands of the printers of the Annual Report at Toronto, it has been found necessary at the last moment to defer it till next month.

Mailed February 9th.

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The Canadian Entomologist.

VOL. XXI. LONDON, MARCH, 1889. No. 3.

DESCRIPTION OF THE PREPARATORY STAGES OF COLIAS MEADII, EDWARDS.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG.—Fusiform, thick in the middle, tapering to a small rounded summit, the base small, flat; ribbed longitudinally after the manner of the genus; colour yellow-green. Duration of this stage four to five days.

YOUNG LARVA.—Length, at 24 hours from egg, .06 inch; cylindrical, even; colour brown-green; thickly covered with black points, from each of which a short fine hair; head rounded, blackish-brown. Duration of this stage five days.

After First Moult.—Length at 12 hours .11 inch; colour dull brown-green; the ridges thickly set with black points, each with short grey hair; head brown-yellow. To next moult six days.

After Second Moult.—Length at 12 hours .16 inch; colour dark green, covered with yellow points so thickly as to give a yellow hue to the whole surface, each point with hair; a mid-dorsal dark stripe; a faint indication of a yellow sub-dorsal line; so also of a basal stripe; head green-brown with many fine tubercles and hairs. To next moult about six days.

After Third Moult.—Length at 12 hours, .22 inch; along the underside of the indistinct sub-dorsal yellow line is an ill-defined row of black spots, one to each segment from 3 to 11; the basal ridge yellowish, but not yet showing a clear band. Later in the stage the black spots show clearly, those on 3 and 4 largest, the rest diminishing regularly to a very small one on 11; head as before. To next moult five to seven days

After Fourth Moult.—Length at 6 hours .46 inch; at 24 hours .52 inch.

MATURE LARVA.—Length .7 inch; cylindrical; nearly even; on the flattened ridges are many points, each giving a short black hair; colour

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dark yellow-green, the effect of the black hairs being to make the body darker than in most species of the genus; a pale yellow narrow sub-dorsal stripe, under which from 2 or 3 to 12 is a black spot on each segment, the anterior ones largest, the others gradually lessening in size to the last; along base a narrow white stripe; under side, feet and pro-legs green; head rounded, a little depressed at top; colour green, lighter than body, much covered with black tubercles with black hairs. From fourth moult to pupation five days.

CHRYSALIS.—Length .66 inch; breadth across mesonotum .16 inch, across abdomen .18 inch; greatest depth .22 inch; shape of the genus; compressed laterally, the thorax on ventral side prominent; head case pointed, beak-like, the projection less prolonged than in some or most species observed; mesonotum rounded, carinated, the sides sloping, a little convex; followed by a shallow depression; abdomen conical; colour green-yellow, all the ventral side being brighter than the dorsal, and the projection at head quite yellow; a mid-dorsal darker line, and a faint sub-dorsal line; all the dorsal side and the ventral of abdomen dotted and mottled whitish, the wing cases and ventral side to head finely granulated. Duration of this stage, in the only case where the butterfly appeared the same season in which the egg was laid, six days.

This alpine species is found in the Rocky Mountains, in Colorado, and probable throughout the range to British America. Certainly it is if *Elis*, Strecker, is synonymous with it, as I believe to be the case. Mr. Mead first took this Colias on top of the "divide" between the Platte and Arkansas valleys, about 12,000 feet elevation, and says he took none lower than at 10,000 feet. Mr. Bruce says the proper habitat is from 11,000 to 12,000 feet, though, when the butterflies get into the narrow canons, they will follow the track down to 9,000 feet at least, and mentions (CAN. ENT., xix., 228) having taken several at Webster, at 9,000.

I received a number of young larvæ, 23rd July, 1888, from Mr. W. S. Foster, at Salida, Col., which had hatched en route. The female was taken on Marsha'l Peak, 11,000 feet, 15th July, and confined over Astragalus. One of these larvæ passed first moult 27th July, the third moult 9th August (the second not observed), the fourth moult 14th August, pupated on 19th, and a female imago came forth 25th August. But the other larvæ, by 28th August, were in lethargy, and soon after

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were sent to Clifton Springs, New York, to go in the refrigerating house, and there they are at this writing.

I had previously had eggs of the species from Mr. David Bruce, 25th July, 1886, laid on 21st and 22nd July, and which hatched 26th. On 31st July several of the larvæ passed first moult; on 6th August began to pass second; on 15th, the third. None of these went to pupæ, but all were asleep early in September, and were sent to New York, but were dead when I received them the following March.

The egg and pupa are like the same stages of *Philodice* in shape; the larva is darker than any Colias I know of, and there is no red in the basal stripe. The sub-dorsal line is not very distinct, but its place is indicated by the row of black spots next it on lower side.

I had no difficulty in rearing these larvæ on white clover, but at same time, in 1888, could not induce larvæ of *C. Scudderii* to eat clover or any other plant, and all died. The same was the case with *C. interior*. Mr. Fletcher and Mr. Scudder both also found it impossible to get larvæ of *interior* to eat of any plant, though they offered everything any Colias is known to eat that was procurable. These two larvæ are the only Colias known to me that will not freely eat white clover or else Amorpha.

COLIAS CÆSONIA, STOLL.

BY JEROME M'NEILL, MOLINE, ILL.

Somewhat to my surprise I found this species not uncommon here during the collecting season of 1887. Although my entomological interest lies in another direction, and I have, consequently, made no special effort to obtain Lepidoptera, I find I have ten specimens of this striking *Colias* in my collection, all of which I have taken during the summer and fall of 1887. On looking over the collection I discover that these specimens were taken at three different times. One—a very much worn specimen, with one hind wing gone—was captured the sixth of June, on Rock Island; six specimens were taken on the twenty-third of July in an upland clover field, two miles south-west of Moline. They are all fresh and bright, and were found in company with *C. philodice*, *Papilio chresphontes*, *P. turnus* and *Danais archippus*. The last three were taken September the sixteenth, in a low-lying field, on the banks of the Mississippi, three miles

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east of Moline. These specimens are, if possible, fresher than those taken July twenty-third. This species would, therefore, seem to be three brooded in this latitude. There are also certain marked differences in coloration, which may or may not be distinguishing characteristics of seasonal varieties. The spring form, as it is represented by the single specimen referred to, is distinguished by the absence of any indication of the sub-marginal row of spots or points on the underside of the wings or any trace of orange, except the two spots on the upper surface of the hind wings; the rose pink ray extending outwards from the body on the hind wings is present. The summer form, as it is represented by the six individuals in my collection, is marked as follows:—The sub-marginal row of spots on the under surface of the wings are none of them pink; those in the interspaces of the first and second, and second and third ediman veinlets, being black, the others brown; the pink stripe on the under side of the hind wings is entirely wanting, and there is on the upper surface of the hind wings a sub-marginal area of orange, bright or faint, which sometimes extends from the marginal black band nearly to the orange discal spot. There is also in all of these specimens a clearly defined oblong raised patch of scales of peculiar form extending along the upper side of the sub-costal vein of the hind wing, from the costal vein to the branching of the first sub-costal veinlet. These scales seem to stand on end, and although I have not satisfied myself of the fact, I think it is probably that these scale-like bodies, are excrescences on the true scales. This patch of scales seems to be confined to the males. It varies in colour from yellow to reddish-orange. When it is yellow it is concolorous with the adjacent surface, and not conspicuous, although the raised margin of the outer edge is always very distinct on a closer examination. In the single specimen of mine in which this area is reddish-orange, it is scarcely less conspicuous than the "dog's head" when the anterior wings are pulled forward far enough to expose it. Since it is present in all the males and absent in all the females I have collected, I take for granted it is a sexual mark. If this character has been described before, I have no knowledge of the description, though it seems strange that it should have been overlooked. Its presence would support Mr. Strecker and others in removing the species from *Colias*. In the fall form, as represented by the three specimens taken September sixteenth, the brown spots on the under sides of the wings are replaced by pink; the two black spots between the first and second, and second and third median veinlets, remaining unchanged; the

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pink stripe on the under side of the hind wings is prominent, and both pairs of wings are margined with a narrow stripe, in some places a mere line of pink extending on the primaries from near the base along the costal and outer margins to the anal angle, and on the secondaries along the anterior and outer margins to the anal angle. On the upper side of the hind wings the distribution of orange is very similar to that in the summer form, but the marginal band of black, which in the latter is comparatively broad and dentated within in the fall form, is narrow and interrupted by the veinlets, so that it is really composed of a series of spots, sub-triangular in shape, with the apex acute and sometimes prolonged into a narrow line which extends into the orange as much as three-sixteenths of an inch. The coloration of the female of this series is so remarkable that it seems to deserve a name, as apparently a dimorphic or at least an aberrant form, and I propose that it be called *rosa*, if it should be found to be a constant variation. The upper surface of the primaries does not differ essentially from the type. The whole upper surface of the secondaries is powdered with brownish-black and orange scales. The black scales are more thickly clustered between the discal orange spot, which is partially obscured by them, and the outer margin. This very much broadened band only partially and unequally obscures the yellow ground colour so that it includes within it a sub-marginal row of large, round, yellow spots, about four in number. The under side of the primaries have the "bright yellow" of the apical portion replaced by bright, deep-rose pink. The under sides of the secondaries are completely suffused with pink, the greenish-yellow scales of the ground colour being partially exposed only along the veins and veinlets. The silvered "pupils" are all that remain of the discal spot and its accompanying spot without the cell. The pink of the under surface is so prevalent that when the butterfly is at rest no other colour is visible, and it looks like a pink blossom. My attention was first called to it by seeing a large *Colias* a few yards in front of me disappear just when I expected to see it at rest on a clover head, as it would fly up at intervals I followed hoping to catch it resting but always puzzled to see it apparently dive head first into the clover. At last, growing impatient, I attempted to "force the fighting," and although I missed my game I so disturbed its flight that I caught a glimpse for the first time of the pink under surface. I was now thoroughly interested and I employed all my arts in vain to decoy or force the wary butterfly into my net. In a few minutes after I had given up the pursuit I caught

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in the same field the same butterfly, or more probably, considering the ease with which the capture was made, another similarly coloured, As soon as I had assured myself that the specimen was as pink as I had supposed, I promised myself three or four, remembering that I had seen two within half an hour, but although there were hundreds of *philodice* I saw no more *cæsonia* that day, and more pressing business prevented me from returning to the locality as I had hoped.

ON THE CITATION OF LOCALITIES.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COL.

It is the custom nowadays to look down with great contempt on those old authorities, who considered "North America," or even "America," a sufficiently accurate locality to give when describing a species; but, perhaps, we of the present age are not quite blameless of similar and (with our means of obtaining information) less excusable carelessness in, that we often think it enough to give the name of the state or region only. Of late, I have been going carefully through as much of the literature of North American Entomology as I could get a sight of out here in the wilderness, in order to catalogue the recorded Colorado insects for the Colorado Biological Association, and I have been astonished at the number of new species described with the localities given indefinitely, "Colorado," "Texas," and so on. Taking eighty-four species of moths at random, mostly new, and recorded from Colorado of late years, I find only twenty-six have the locality indicated nearer than "Colorado"—and I think this is a very fair sample of the whole. Now, do these describers of species ever stop to consider what "Colorado" may mean? That it may refer to any altitude from below 4,000 to over 14,000 feet, and to anywhere in an area of no less than 103,948 square miles? That "Colorado" may mean snowy peaks, mountain forests or valleys, or level treeless plains, each presenting a distinct fauna of its own? Perhaps they do not stop to consider these points, possibly they do not care, so long as the species has been properly classified and named, and is henceforth recognizable in the cabinet. Well, we cannot all be systematic entomologists, students of geographical distribution, biologists and the rest, but, surely we may be precise in touching on departments not our own, and, if we are giving localities, there is no reason why they should not be sufficiently accurate

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and detailed to be useful. It may, perhaps, be answered that most of the species are not collected by the writers themselves, and the collectors sent no exact localities. Probably not, but were they asked for them? Collectors will supply proper localities, and often very interesting details if they are given to understand that these are wanted—as is plainly evident from the fact, that some few careful authors always manage to know where their species come from, and a good deal about them besides.

My own idea in the matter is, that every description of new species ought, if possible, to have the collector's own notes appended thereto, so that we might have some idea of what the *living* insect was like, and not only have an account of its dried remains impaled on a pin. Fancy, if someone undertook to write an account of the human race, founded entirely upon information obtained in the post-mortem room and anatomical museums! But, if we cannot have biological notes, let us at least have localities—they can be got when they are wanted, and indeed, I have known some instances in which names of localities have been duly sent in, but never mentioned by the describing author.

Sometimes authors take it for granted that because they write from a certain place, it will be understood that the species were captured there, but I could easily demonstrate that such an assumption, in all cases in which the locality is not given, would lead us into quite ridiculous errors, and this being so, how are we to discriminate? One usually precise author, who has described a very large number of new species of late years, has given for most of them only the name of the state in which he resides, and for many no locality at all. Now, according to Packard, this state embraces two distinct Zoö-geographical regions, so it becomes of especial importance to know exactly where the insects in question came from. So I wrote to this author, expostulating with him on this point, and he replied that he quite agreed with me that localities should be properly defined, and all the species I alluded to were to be understood to come from the vicinity of the town in which he resided. Now, this is excellent, provided that the lacking or indefinite localities *are* so understood; but on the face of it, until I had this information from the author, this fact was not always evident. Perhaps it has been stated somewhere in his writings; but this hardly betters matters for the student, who naturally takes one paper at a time, and considers it on its own merits, unless referred back to previous remarks bearing upon it.

Fortunately, there are some systematists who do appreciate the value

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of precision in localities, and I was pleasantly surprised a short time ago at receiving the following from a well-known naturalist, to whom I had sent a list of mammalia, with their distribution given by counties:—"I hope you keep the exact localities as well as the counties. Most of the counties in Colorado are so large that they include great variations in altitude and physiographic conditions, and hence embrace widely different faunal characteristics." With this quotation I close the subject, commending it to all describers of Colorado and other insects, and drawing their attention to the fact, that after all it expresses the views of all really competent Vertebrate Zoölogists, Conchologists, and Botanists, and hoping that in the future they also will give proper attention to the citation of localities.

One other matter may deserve a passing notice—that of giving credit to collectors. I have nothing to complain of under this head myself, and so can speak more freely. It seems to me, that a systematist who receives specimens from a collector, who, we may assume, has gone to considerable trouble to collect them, and fails to credit him with the captures when describing, does about as discourteous a thing as is possible in Entomological literature. It would be very easy to show that from a scientific point of view, it is always useful to know who collected the specimens in question, and at the risk of being called egotistical, I do not mind saying that I desire and expect that new species I may have collected shall be duly credited to me in publication, and I am sure all other collectors must feel the same. I do not wish to be personal, but very many quite recent cases, in which no collector's name has been given, will occur to everyone*—I need not enumerate them. Some authors seem to think that if they have obtained specimens from professional collectors, they are then, at anyrate, at liberty to omit the collector's name. It seems to me that they are, if anything, under increased obligation to give it. Fancy what an author would say if the editor of a magazine refused to publish his name to an article because he had paid for it! This matter of crediting collectors† is, I think, a serious one, but collectors can easily put it right if they will make a point of only sending specimens to those who will give them credit.

* In some of these cases, however, the authors are probably blameless. It is not always possible to ascertain who was the collector.

† One kind of "crediting," however, I *do* think unwise. If Tompkinson discovers a new insect, I cannot myself see that that is any reason why the poor creature should ever after be burdened with the name "*Tompkinsoni*"!!

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LENGTH OF LIFE IN BUTTERFLIES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Aurelians are frequently asked how long butterflies live. By this is generally meant what is the length of life of the mature insect. As is generally known, each species passes through one cycle of its existence once a year, though it very frequently happens that two, three, or even more generations succeed one another during a single season, and it has been supposed (though never proven) to be the case with some that two or more years are required for this cycle; as is known to be true of some other insects. But with regard to the length of life of the butterfly itself, there is not a little variety; when the disappearance of a given butterfly is in consequence of the approaching cold season it may well be and often is the case that the butterfly has merely gone into winter quarters to appear again on the wing the ensuing spring. In cases like these, the duration of life of a butterfly may be as long as eight or nine months or even more, for there are hibernating butterflies which emerge from the chrysalis by the beginning of August or even in July, but which do not go into winter quarters until September, October or even November, then appear again the next season as soon as advancing spring has begun to make itself felt, and continue upon the wing sometimes through June, sometimes even into July. It is impossible to say certainly whether or not the individuals flying latest in the spring number among them any which were earliest to escape from the chrysalis in the preceding season. But setting aside the chances of capture by their enemies, there is no reason to believe it impossible, and that they may spend and probably in many instances do spend fully ten months of the year in the winged condition.

This conclusion may be reached also in another way. We may add together the ordinary life period of the egg, the time it takes the caterpillar to reach maturity, and the period of the chrysalis, and in these hibernating butterflies we shall rarely find that these stages together occupy on the average more than two months. The remaining ten months must therefore be the average time spent upon the wing, That many may live eleven months or even twelve seems probable, for a butterfly may continue to fly for some time after the first eggs are laid, especially in the case of those which lay but one at a time, where the eggs do not develop in the

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ovaries at once, but slowly and by degrees, and so are deposited in succession over a considerable period of time.

In an article in the CAN. ENT. (xiii., 205–214) on this subject, Mr. W. H. Edwards has laboured to show that eggs are almost invariably laid by butterflies fresh from the chrysalis, and that the butterfly dies soon after the laying of the eggs. This proves quite too much, for if it were so, a butterfly would hardly fly more than a week. That eggs are often laid by butterflies soon after eclosion from the chrysalis is doubtless true, but there are quite as many cases where egg laying is delayed for a considerable length of time,—two, three or four weeks; an examination of the ovaries of butterflies will show that it is rarely the case that all the eggs are laid even within two or three days of each other, but that they mature by degrees too slowly for such rapid oviposition. There are of course some, in which the eggs are laid in masses, when a greater number are laid in a single day, but the cases are far more numerous when egg laying is continued over many days, and sometimes probably over several weeks.

It is possible that the duration of the life of butterflies is greater in the north than in the south. As one approaches the tropics, insectivorous birds and other creatures are far more destructive of butterfly life than with us, and the chance of long life upon the wing must be greatly lessened with the numerous liabilities to disaster which overtake the poor butterfly in the warmer regions. There may even be a difference in this respect between districts so near each other as West Virginia and New England. For certainly my own experience of the overlapping of broods of different butterflies as seen by me in New England is very different from that reported by Mr. Edwards in West Virginia, and inasmuch as these broods follow each other with greater rapidity in Virginia than with us, the difference is thereby exaggerated.

To judge from the statistics that I have collected from observations made in the field both by myself and numerous correspondents, I am inclined to think that, in the case of those butterflies which are born and die the same season, the average length of life of the mass of them, that is, omitting mention of those which, cut off early, come to an untimely end, to be not far from four or five weeks, varying in different species from three to six or seven. Of course it is impossible to arrive at any very accurate determination regarding this, since in the case of any particular species we are obliged to base our conclusions on observations of

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the times when the earliest butterflies were seen, when they became most abundant, when the numbers perceptibly diminished, or specimens became old and worn, and when the last were seen. It is particularly difficult to decide upon the average age of individuals, when, as is not infrequently the case, a brood of butterflies is augmented by gradual accretions for a long period of time, three, four or five weeks. It is again difficult in the case of those butterflies, and there are not a few of them, like some of our Argynnidi, which appear upon the wing in mid-summer, receive a sudden accession to their numbers a month or two after the advent of the earliest and then only begin to lay their eggs. I, for one, can hardly believe that all these earliest individuals perish before the season for egg laying, and I even think from the condition of specimens, worse and worse as the season progresses, that some of the earliest live to the last and are upon the wing sometimes for two and three months of the year.

ON SPECIFIC NAMES.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Dr. Williston, in his painstaking work on the *Syrphidæ*, says: "There are no generic and specific limitations in nature," and illustrates the statement by the present knowledge of the family with which his synopsis deals. And what Dr. Williston brings forward is a mere quota of the mass of evidence brought out by naturalists generally, and by entomologists dealing with the different orders of insects. But while, theoretically, the essential unity of living forms or of nature as a whole may be granted, the practical question of what names we shall bestow upon our specimens and upon what basis these names shall repose, must be solved. Our systems of nomenclature must be brought into consonance with the facts observed. And it is well that our nomenclature be not too rigorous, so that I have expressed the opinion in these pages that we shall have to use in certain cases a trinomial title. With regard to the test for genera in the moths, I have to refer for my conclusions to a paper in Papilio, 3, 35, where I say that the *amount* and *extent* of the peculiarity gives the criterion, not the *kind*. Every well-marked variation and modification of structure, which can be clearly made out by the microscope or otherwise, is of generic value. The moment this rule is departed from, we are thrown upon individual "opinions." All the characters which, when well-marked, are of generic importance, are liable to slighter modi-

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fications, which are only specific. It is the *kind, constancy* or *amount* of these modifications which must decide the class in our artificial divisions of these natural objects. And here the tact of the specialist, of which Dr. Williston also speaks, comes into play. With regard to the criterion for species, I have expressed myself already clearly in these pages, so far as the Lepidoptera are concerned. For the student of butterflies and moths, the criterion for species must lie in a knowledge of the whole life of the insect. If it breeds true to type, nowhere encroaching upon the cycle of its neighbour, we must bestow a specific title. The insect is to-day a species, whatever its ancestry, whatever its probable future development. The fact, from our experience, may be assumed without a knowledge of the larva and natural history, but *until* this knowledge is also added to our observations on the perfect insect, the specific title is not firmly or conclusively founded. This is what I meant to say with regard to the forms of *Callimorpha*. Now in separating the forms of *Datana*, we had alcoholic specimens of the larva and the personal observations of Mr. Angus to fall back upon, for most of the species. And the fact with these moths that in the earliest stages the species are not distinguishable on sight, has been shown by Mr. Wm. H. Edwards to be true with nearly related butterflies, as for instance species of Colias. While breeding has revealed to us a number of questions, such as dimorphism, which we must take into consideration, I must still renew my protest against *lumping* upon grounds drawn from the perfect insect alone and upon insufficient evidence. The new facts lead us insensibly to criticize species, to conceive a prejudice against them, and then to lump without sufficient evidence. And I repeat, that as Entomologists we are here to discriminate, to separate, not to confound. Butterflies were by the ancient Hebrews classed among "flying things." From this primitive conception of their place in animated nature, we have gradually come to-day into nearer definitions of their relationship.

In the discussion of all these questions there can be no progress without reasonableness. Temper and even position will not ultimately decide these questions, although the melancholy conclusion of Spinoza is here not without its truth: "unusquisque tantum juris habet, quantum potentia valet." The appeal to time need not always have to be made. A great deal of what is wrong and one-sided need not afflict us, as Entomologists, if we would only take matters coolly, or only grow warm over the beauties of our treasures.

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DR. CHRISTIAN ZIMMERMANN.

BY H. A. HAGEN, CAMBRIDGE, MASS.

There exists no biography nor necrology of this excellent entomologist, as far as known to me, though he lived for thirty-nine years in the United States. I am much indebted to Dr. Geo. C. Horn for Zimmermann's note-book, which, with his library, came into the hands of the late Dr. J. L. Leconte.

Only a very short abstract of the contents, which are written wholly in German, can be given. The entries begin with Zimmermann's earliest boyhood and end in 1843, followed by a few pages for 1865. The narrow pages contain only the substances of events in short phrases, often very cutting, both for Europe and for America. If the whole could be published, it would give a very interesting picture of the life of an excellent naturalist, always kept down and hindered by want and ill-luck, but always ready to "begin again." It is sad that such a life, akin to the remarkable histories of former ages published by the masterhand of G. Freytag, should have been possible in the 19th century—a continuous struggle of a noble soul with continuous misfortune.

Christian Zimmermann was born in Quedlinburg, Prussia, September 6, 1800. His father and three generations before him were carpenters, as the name indicates; all were born and died in Quedlinburg. Christian entered the gymnasium in 1811, and graduated in 1821. The note-book, May 26, 1814, says: "I am to-day 5000 days old." (He always counts his life, both in Europe and here, by the 1000 days.) The collection of beetles begins, and the study of music. His talent for music must have been obvious, as one year later he played the organ for the church-service, and studied thorough bass. When he graduated he writes: "Up to this time my money was made by keeping score for target-shooting, teaching children, giving music-lessons, organ-playing, copying music, furnishing music at funerals, stuffing birds."

His parents, who were poor, proposed that he should choose a profession; but determined to study, he went to Halle, where he stayed as student from 1821 to 1825. He passed his examination after having attended the lectures in theology, philology and philosophy, but his entomological studies were never neglected.

In 1827 he published his first music, a Polonaise. When he left Halle in 1828, he was already acquainted with a large number of eminent

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zoologists. He went to Berlin, and writes: "Great expectations, small success, a load of cares, experience of the world." He worked with Prof. Klug in the Museum, and gave Latin lessons to barbers' apprentices. March, 1829, working up the genus Amara, of which some sheets were printed. 1830, very bad times begin; want of money. 1831, monograph of the genus Zabrus finished; printed in June.

During this time he had become acquainted with many prominent entomologists and with a large number of students, who later became famous, but the constant want of means was so depressing that he decided to try his fortune as a collector in Mexico. He sold his collection of 2,400 species of beetles and his books. To enable him to fulfil his intentions, twenty-four naturalists of prominence from Germany, England and Russia subscribed six hundred dollars, and a number of friends six hundred and eighty dollars to pay his debts. This was all repaid with interest by Zimmermann, as soon as he had made money here, as a page in his note-book states. He left Hamburg, Aug. 5, 1832, as steerage passenger for Philadelphia. He began directly to collect, and to study the English language. His collection grew rapidly, but in a few months he saw that it was impossible to work in expensive America for cheap Europe without running in debt. So he decided to leave Philadelphia and to try his luck as a teacher in South Carolina. He made the trip, according to the custom of German students, on foot, a knapsack on his shoulders and a few dollars in his pocket. This journey of 713 miles, in the midst of a severe winter, and attended with much hardship, which proves his excellent health and strength, was made in fifty days, with twenty-seven dollars in cash, six dollars credit, three maps, one book and a pocket-knife. The visit to Dr. Melsheimer on this trip has been published before by me. The detailed report of excursion given by Zimmermann to Prof. Burmeister is very interesting, but has never been printed. Zimmermann had no idea that he was here considered simply a tramp, which explains easily and rightly most of his complaints.

In Georgetown, S. C., he tuned pianos and gave music-lessons till he was engaged in the South Carolina Female Institute, at Berhamville, to teach music and drawing. This happy change in his circumstances allowed him to pay directly the debts made in Europe, with five per cent. interest. He collected largely; sometimes quoting the number collected at the end of the month or the year, as: "11,508 specimens have been

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collected," besides mentioning any remarkable forms. He made many excursions, visited Cambridge (where he saw Harris), Niagara, Albany, the Catskills, New York and its surroundings. He made the acquaintance of every naturalist of eminence. He sent to Europe many insects and received many from there, together with the newest publications. His correspondence was apparently a large one.

After a few years his situation in the school where he was engaged was given up; it had become unpleasant sometime before. He possessed now an excellent collection, very comfortable furniture and three thousand dollars, and decided to buy a little farm to be used as a nursery and for raising silk-worms. In 1839 he made, as he states, fourteen "farm reisen" in Philadelphia, Maryland and other states, partly with Ziegler and Morris. His project proved to be a failure, and he decided to return to Europe and to send his property to New York. After a short visit to Harris, he went to New York to find that the vessel with all his property was lost in a fearful storm. His note-book says: "Sept. 10, I am notified of the loss of my collection and property." "Sept. 16, beginning of a new collection; the voyage is given up." "Sept. 25, invitation of Harris to come to Cambridge," where he stayed until November 12. On Nov. 7th new insect-boxes were bought of the box-maker, Newell, in Cambridge. He made many excursions with Harris, whose family very well remember the German naturalist.

The next year he lived in Baltimore, occupied with entomological systems and excursions with Mr. Morris, and decided to return to South Carolina. Feb. 27, records a "letter to Hannah, with an offer of marriage." March 21, "Hannah answers 'yes.'" April 3, "I find Horia sanguinipennis." April 14, "I find Trichius maculosus."

He had made the acquaintance of Mrs. Hannah Green, aftewards his wife, seven years ago in Georgetown, S. C. We find in his note-book, "Evening with Hannah; drawings on the wall; Sweet Home and picture; quarrels plenty." Monday, June 21, "Arrival at Rockingham, N. C." June 22, "I reach the town in the morning, visit Hannah at noon, and am married in the evening."

"Hannah begins her school, July 16, with sixteen pupils, and seven pupils of mine in music and drawing."

"Sept. 17, dispute took place with Hannah about American culture,

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and the fight that lately happened in Washington among the members of Congress."

It very soon became apparent that it was impossible to make a comfortable living in North Carolina, and they decided to return to Columbia, S. C. Here they built a school-house, forty feet by sixteen, which was inaugurated December 18, 1843. The expense was, for the building, $417; for Loring's globes, $33. Income during the year, $1,521; expenses, $1,277.

This is the last entry in the diary, and I know nothing more of his life except what is told in some letters to Thaddeus W. Harris. Some extracts follow: "1865, January 1, I possess $570 in Confederate money; $200 in Confederate bonds; $900 in certificates; $200 in provision store shares; $13 in bank notes; $114 in silver. Feb. 10, the Yankees are in Barnwell Co. To-day's prices—A load of oak wood, $140; a barrel of flour, $550; a pound of brown sugar, $12; a bushel of corn, $35. Feb. 17, the Yankees are here, 75,000 strong. This is the last day of Columbia. They at once entered the houses, got drunk and set fire to everything. I began to move everything that could be moved into the garden; but they broke open the trunks and boxes with their swords, and followed this up with a regular and general plunder. Feb. 22, the Army has left. All quiet. My collection and books brought back in the house. Expenses for this day—1 bushel meal, $40; 13 lbs. beef, $22; molasses, $6. July 1, we still possess $1,100 Confederate State bonds, worth nothing; $915 Confederate treasury notes, worth nothing; $13 South Carolina bank bills, worth — (?); $3 South Carolina state bills, worth — (?); silver money, $74; gold, $2.50; copper, 5c. We must begin again at the beginning."

This is the closing sentence. These few, simple words, without any moan over the loss of his all, are not a little touching, all the more so, because the pathos is unintentional—the pathos of facts, not of words. They call to mind his former record of the loss of everything by shipwreck on the 10th September, 1839, followed by the entry on Sept. 16th, "Beginning of a new collection."

Zimmermann died in December, 1867. He left no children.

His interest in science was always kept up. Nearly every month the number of insects collected is reported, sometimes amounting to 3,725, and during the year to 11,500. In November, 1842, he sent fifty dollars to T. W. Harris, to buy three Goliaths. He constantly bought books both in Europe and America, and his library was valuable. It was bought

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by the Museum of Harvard College, in Cambridge, excepting some volumes which were retained for his own use by Dr. J. L. Leconte, at whose instance the purchase was made.

His collection is also in the Museum, having been bought first by Dr. Lewis, of Philadephia, and from him by the late R. Crotch, who sold it to the Museum. A great part is in Leconte's collection, and can be recognized at once by the numbers on the pins in Zimmermann's hand-writing.

He was an unwearying worker. In 1842, he wrote to Harris that he was occupied with a systematic arrangement of the Lamellicorns, and wanted Echiurus and Goliath for study. In April, 1844, he writes again to Harris: "I have almost finished my chapter on Lamellicorns."

(To be Continued.)

NOTES FOR COLLECTORS VISITING THE PRAIRIES AND ROCKY MOUNTAINS.

BY GAMBLE GEDDES, TORONTO.

Now that the winter is well advanced and before many weeks are over spring will be upon us, it reminds me of many enquiries made during the last few years about the localities and dates of diurnals captured by me in the North-west in 1883 and 1884. These particulars are nearly all to be found at the National Museum of the Geological Museum at Ottawa, but for the benefit of those who may be visiting the North-west with a view to collecting diurnals, I propose to give such information about the rarest species as my notes supply, and as my limited time will permit.

Beginning with June 10th, 1883, at Brandon, N. W. T., I find *Phyciodes carlota* Reak. was taken, and *Lycæua afra* W. H. Ed.

June 12th, Fort Ellis.—*Erebia epipsodea* Butl. was in beautiful condition.

June 15th, Medicine Hat.—*Colias Scudderii* ♀ and *Colias christina* ♂, *Cœnonympha inornata.*

June 29th.—*C. christina* ♂ plentiful, *C. Astræa* ♀ (?) one specimen or two.

June 30th, Calgary.—*Chionobas varuna*, *Satyrus* var. *boopis*, *Lycæna afra*, *L. anna*, *L. amyntula*, *L. rustica*, *L. sæpiolus*, *C. ochracea* and *inornata;* of Colias four varieties, viz.: *C. Edwardsii*, *C. Scudderii*,

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C. alexandra and *C. christina; Anthocharis olympia, A. ausonides,* about the swamps; *Argynnis nevadensis, A. artonis, A. Edwardsii, A. bellona; Phyciodes carlota, P. tharos; Chrysophanus epixanthe, C. helloides, Pamphila Manitoba, Zabulon, Cernes, Manataaqua.* Not a bad day's work for the last day of June.

July 8th, Edmonton.—*Arg. lais* and *cybele, Lim. arthemis, L. disippus, Lyc. anna.* No Colias or Pieris seen to-day.

July 23rd, Fort Macleod.—*Arg. leto* ♀ and *Chrys. sirius.*

July 25th to 30th, Pincher Creek.—*Arg. clio* and *eurynome* taken; *Arg. artonis; Pieris occidentalis.*

July 30th.—First specimens of *Parnassius smiutheus, Chrysophanus Florus, Col. Scudderii* ♀ pale green. Several taken.

Aug. 1st.—*Thecla mopsus, T. titus.*

Aug. 2nd, Garnett Ranche, mouth of Crow Nest Pass.—*Colias Hagenii.*

Aug. 3rd.—*Par. smiutheus.* Very common, both sexes.

Aug. 5th.—*Satyrus charon,* and *Sat. sylvestris,* and *Arg. leto.*

Aug. 6th.—*Arg. boisduvallii, Limenitis lorquinii, Chrys. mariposa, Mel. pallas, Mel. nubigena.*

Aug. 8th.—*Arg. monticola, Pieris oleracea.*

Aug. 15th, Belly River.—*Col. Hagenii*; dwarfed in size, and every shade from albino to orange.

In 1884 I started much later, leaving Toronto 26th June.

June 30th.—Saw one ♀ *Colias christina,* first day out west from Winnipeg.

July 1st, Swift Current.—*Chysophanus dione, Arg. Edwardsii, A. Nevadensis, Euptoieta claudia.*

July 3rd to 7th, Calgary.—*Col. christina, A. lais, A. Nevadensis, A. artonis, Thymelicus hylax.*

July 10th, Morley (now Canmore) station, C. P. R.—*Lycæna shasta, Arg. monticola.*

Aug. 1st, Laggan.—*Anthocharis hyantis* and *ausonides, Chrys. mariposa, Chion chryxus, Colias elis.* This was a grand point for collecting. Emerald Lake, about 4 miles from here, is a lovely spot, and the vegetation plentiful and varied, with large numbers of insects.

I have curtailed this as much as possible, but I shall be glad to correspond with anyone going to collect this season, with a certain feeling that, if the eggs of *Colias elis* can be obtained, we shall have the mystery cleared up about the ♂ of this beautiful fly.

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AGAIN RILEYA.

BY L. O. HOWARD, WASHINGTON, D. C.

If all controversial writings were as happy as Mr. Ashmead's last, readers of the CANADIAN ENTOMOLOGIST would not regret the space occupied, and I am glad that one side of the controversy is interesting reading. I hope I may be allowed space to say that Mr. Ashmead admits in conversation that he has erred in his statement that my first publication of the description of Rileya was in the CANADIAN ENTOMOLOGIST for Oct., 1888, as I have shown him the last page of *Entomologica Americana* for July, 1888. May I also state dates once more? Mr. Ashmead's first mention of Rileya was published in his synoptic table in *Entom. Am.* for June, 1888. My full description was then in the hands of Mr. Smith, and was published in *Entom. Am.* for July, 1888. Mr. Ashmead's full description appeared in the Kansas Agric. Exper. Station Bull., in July, nine days later than mine. Entomologists following Mr. Ashmead's views are perfectly at liberty to use the excellent generic name he has proposed for my Rileya, while for the use of those who adopt my views, (and I am happy to say that several well-known entomologists have expressed themselves in my favour), I venture to propose for the Eurytomid genus which was called Rileya, the appropriate generic name *Ashmeadia*, as indicating my appreciation of Mr. Ashmead's unflagging industry as an entomological worker.

CORRESPONDENCE.

COLIAS CHIONE, CURTIS.

Dear Sir: It may be of interest to some of our readers, who are interested in the genus Colias, to know that Mr. F. Fitz Payne, (who accompanied Lieut. Gordon's expedition on the "Alert" to the Arctic regions), brought back amongst his collection a single specimen of a most peculiar green coloured female Colias. It was sent to Mr. W. H. Edwards first, who examined it, but did not pronounce decidedly upon its name. A few weeks ago Mr. Henry Edwards was spending an afternoon with me, not long after his visit to the British Museum, and he assures me I have got the ♀ of *Colias Chione*, Curtis. The only other specimen known being in the British Museum. I observe that Mr.

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Kirby has placed this in his catalogue of Diurnal Lepidoptera as variety "A" of C. *Boothii* Curtis, and both *Boothii* and *Chione* were taken in Ross's 2nd voyage, and both the species and variety were described by Curtis, in 1835. It would be a curious coincidence if, after an interval of over half a century this turned out to be a good species. I have written to a friend, who constantly visits the British Museum, for full particulars and description of the specimen in the collection there, and will state his views through the medium of the CANADIAN ENTOMOLOGIST in a future number. GAMBLE GEDDES, Toronto.

ARCTIA PHYLLIRA, DRURY.

Dear Sir: When I was in London a year ago, working on the Society's collection, I found amongst the Arctians one that clearly did not belong to any of the forms represented therein; it had the label of A. P. Saunders attached, bearing date July 6th, 1886. Being unknown to me I labelled it "undetermined," and laid it aside; recently, however, when turning over some of the books in the splendid library of the Society, I found the unnamed Arctian unmistakably represented on plate lxiv, vol. 2 of Smith & Abbot, and named *Phalæna phyllira;* also in Westwood's Drury, vol. 1, plate vii, fig. 2. It is quite an attractive form, and new to the Canadian list. Mr. H. S. Saunders also has a specimen, taken at electric light, Sep. 6th, 1887. J. ALSTON MOFFAT.

NOTE.

Later on there will certainly be more to be said respecting certain points touched upon by me in the CAN. ENT. for 1888, but there are four things it will be useful to refer to now. Since writing on *Nathalis iole* (p. 156) I have found that there exists a form of the ♂ in which the "orange spot" is yellow during life. With regard to the forms of *Colias eurytheme* in this locality (p. 201), I now find there is a short flight of genuine *eriphyle* here in September, but the specimens are not so extreme in their divergence from *autumnalis* as one Mr. W. H. Edwards sent me (locality not stated). I shall have more to say about all these forms of *enrytheme* later on. The yellow spider on pink flowers (p. 176) and the Asilid fly attacking *C. eurytheme* (p. 202) have been kindly examined by Dr. C. V. Riley and pronounced to be species of *Misumena* and *Stenopogon.* T. D. A. COCKERELL, West Cliff, Col.

Mailed March 7th.

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The Canadian Entomologist.

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DESCRIPTION OF THE PREPARATORY STAGES OF ARGE GALATHEA, LINN., WITH NOTES ON CERTAIN SATYRINÆ.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG. — Sub-ovoid, broadest on lower third, the base flattened; covered with a very slight rhomboidal network over the upper third, with low knobs at the angles; on the middle the network is still more slight, but the knobs are distinct, and on the lower third the knobs are minute and unconnected by lines; summit flattened, concave; the micropyle in centre of very fine network without knobs; colour bone-white. Duration of this stage about 20 days.

YOUNG LARVA.—Length, at 12 hours from the egg, .1 inch; thickest anteriorly, tapering to 13, which ends in two short sub-conical tails; colour yellow, with a tint of red; the tubercles arranged as in Erebia, forming three longitudinal rows on either side; these are small, conical, each with a long curved whitish hair; feet, legs and under side same colour as upper surface; head sub-globose, broader than 2, granulated, with a few whitish points and long hairs; colour brownish-yellow. The larvæ hibernated from the egg.

After First Moult.—Length at 12 hours, .18 inch; colour yellow-buff; a narrow pinkish mid-dorsal stripe, a sub-dorsal same width, then as much of buff on side, and a broad pinkish stripe to the basal ridge, which is yellowish; under side, feet and legs, yellow-brown; body covered with a downy coat of yellowish hairs from fine points, and among them on each segment are black hairs from larger and darker tubercles; head sub-globose, yellow-brown, with yellow and black hairs like those of body. Duration of this stage 11 days.

After Second Moult.—Length .3 inch; stout; yellow-buff; a darker mid-dorsal stripe, and a similar broad lateral band; the basal ridge paler than the ground; under side greenish-buff; thickly covered with buff hairs; head green-buff. Duration of this stage 10 days.

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After Third Moult.—Length .65 inch. At nine days from this moult was full grown.

MATURE LARVA.—Length 1.1 inch; stout; thickest at 4 and 5, tapering rapidly to 13, and ending in two short sub conical tails; colour buff the dorsal area of a yellow tint, the sides reddish; the under side a green tint up to the red-buff; feet and legs same; a brown mid-dorsal stripe; on side the band a shade darker than the ground; the basal ridge lighter, or yellowish; body thickly covered with rather stiff, long hairs; head small, sub-globose, a little depressed at top; colour greenish-buff, with many buff tubercles and hairs both long and short. (Fig. 1.)

Soon after, the colours became paler, the bands faded, and the larva was lethargic, eating nothing, but lying at the top of the sod curved like a figure 6. At 18 days from third moult pupated in the grass, unattached.

CHRYSALIS.—Length .54 inch; breadth at mesonotum .18 inch, across abdomen .24 inch; abdomen remarkably stout (one-third broader than the anterior segments), conical, but irregularly so, the ventral side and the whole body up to thoracic segments being greatly swollen, while on dorsum the curve is slight, and rises no higher than does the mesonotum; this last is very low, rounded both ways; the head case short, rounded at end, rounded transversely and at the corners; at each shoulder, over the thoracic spiracle, a black-brown, corrugated shell-like process standing out obliquely and quite prominent, in the middle sometimes a little separated from the surface of the body; cremaster short, bluntly pointed, on dorsal side having same curve with abdomen, on ventral side excavated, with the edges thickened, horse-shoe shaped, and having at the end a brush of short, stiff bristles, straight, not the least hooked. (Figs. 3, 4, 5 to 8.) Duration of this stage 14 days.

This pupa is very like that of Eudamus *Tityrus* and *Lycidas;* the same dorsal and ventral outlines, same slope from mesonotum to top of head, same form of head case; and the thoracic spiracle protector (Fig. 8), as Mr. Scudder calls it, is similar in both; in *Galathea* this process is more curved and shell-like, and a little more projected from the surface, but they are essentially of same character.

GALATHEA flies in Europe and Algeria, according to Kirby. It is prettily checkered in black and white, has a slender body, and large wings in proportion, as in most of the family. It has no near ally in North

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America. Kirby places its genus, which he calls Melanargia, next to what he calls Œneis, Hübner, but which should read Chionobas, Boisduval.*

The imago and two varieties of the larvæ are figured in Humphrey and Westwood's Brit. But., and what purports to be the pupa, suspended by the tail from a leaf of grass. There is no resemblance at all between the pupa so figured and the true pupa. The description of the larva is limited to one line, "yellow-green, with a dark line down the back and on each side."

In Buckler's "Larvæ of British Butterflies and Moths," 1886, (a book which every working Lepidopterist ought to own, and published at a very low price, to wit: ten dollars for the two volumes so far issued, the first one covering the Rhopalocera); on plate iii. is figured the adult larva of *Galathea* and the pupa. I have had this larva copied on my plate, Fig. 1. The text, which is by Rev. J. Hellins, represents the pupa as found on the sod, and unattached by the tail. This figure suggests an affinity to certain moths, noctuids especially,† and led me to wish to breed the species from the egg. M. Paul Chrétien, of Paris, kindly obtained eggs and sent them in a quill, in letter. They reached me 3rd Aug., 1886, thirteen days out, and hatched the next day. The larva, when about to come forth, cut the top in a circle, but not completely around, and raising this trap door made its way out, the door immediately falling back. The egg looked almost uninjured. The larva did not eat the egg shell. I mention this, because Mr. Hellins says the young larva "eats up its egg shell almost entirely," and he adds, "and thenceforward feeds on grasses," also, "it hybernates when very small." My larvæ hybernated at once from the egg, just as the larva of Satyrus *Alope* does. I put the little animals in the cellar, and later sent them to Clifton Springs, N. Y., to go in the refrigerating house there. They came back 21st March, 1887, in good condition. On 12th April, one passed the first moult. This larva

* There is no such genus properly as Œneis, Hübner. There is a coitus of that name in Hübner's Verzeichniss, made up of mixed Chionobas and Hipparchia, and another one also made of the same two genera. By calling a coitus a genus, which it is not and was not intended to be, eliminating the Hipparchias from both these coitus, dovetailing together what remains, and calling the manufacture Œneis, with a label Hübner, 1816, we get what is called the genus. The makers of lists and catalogues about 1870 hit on this contrivance, and many European authors have come to adopt the name Œneis. In this country it has not met so favourable a reception. Perhaps the first definition of the genus Œneis (and a definition is indispensable to recognition) was given by Mr. Scudder, in Syst. Rev., 1872; but Chionobas, Boisduval, 1832, has the priority.

† This figure resembles the larva of Agrotis, all but the terminal segment, which is Bombycid.

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passed the second moult 23rd April, the third 4th May, and pupated 22nd May. I succeeded in getting but the one larva to pupation, and having accidentally injured the surface of the pupa, I put it in alcohol. The next year, M. Chrétien sent more eggs in same way. They hatched, and the larvæ went at once into lethargy, as before. They came back from New York, 6th April, 1888. I recorded that one was about to pass its first moult on 20th April, that two were at same time about to pass second, and two had already passed second on 5th June; that the appearance and attitudes of these larvæ are very much like noctuid larvæ. They are obese, sluggish, and spend most of the time lying on their backs or sides on the surface of the sod, the head and next segments bent in; or else they lie in a complete ring, the tail and head meeting. If resting on a stem of grass, the body is supported by the pro-legs only, the anterior segments arched, the feet not touching the stem. Now and then I found one feeding, but they did this mostly at night. On 13th June, one larva was evidently near pupation, by the pale hue of the skin and the disappearance of the lines. I record that it lies on its side and back between two stems, wedged in, its feet in the air. Next day it had got away from the stems and was lying on its back, much doubled up (Fig. 2). The following day it had pupated just where I had last seen it, unattached by the tail.

By 17th, I noticed that a second larva had fixed itself as I had recently seen one of Erebia *Epipsodea* do when about to pupate. It was nearly an inch clear of and above the sod, had drawn a few leaves of grass together by a few threads and rested among them upright, holding to the edge of a leaf by the prolegs, the dorsum much bent and turned to the left. An hour later the larva had loosed its hold and slid down, and was sticking upright in the sod, but had reversed its position, the dorsum now facing to the right. There it pupated, upright.

On 18th, another larva was lying on its back, like the first one mentioned. I had had a long search for it, and feared it had escaped, but by clipping the grass stem by stem, it was found low down in the sod, and there it pupated, 20th. The fourth also pupated, but among the roots, and was found only by pulling the sod in pieces. The fifth pupated in the night of 4th and 5th July. It had fallen off the bag which covered the plant, and was lying motionless on the earth. I laid it on its side among the leaves, and there it pupated, spinning no thread. From these pupæ I got five butterflies, the first one on 28th June, the last in middle of July.

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Buckler figures what is called the third moult, and again the fourth moult. But, as I have said, my larvæ, in both years, passed three moults only. From the size of the figures I should say that both represented the same stage, one just after third moult, the other at maturity. Nothing is said of moults in the text. The young larva is described, then at length of 2.5 mm., and the mature larva at 30 mm. Mr. Hellins agrees with Westwood that the colour is variable, being buff, but sometimes green. All my larvæ were buff. It is stated that the larva "becomes full fed in June, and changes to pupa without suspending itself in any way, or making a cocoon," and the author adds, "I think it" (in natural state) "would hide itself, as my example did. I found they had got among the thick moss with which I had furnished the bottom of their cage, and apparently made little hollows for themselves by turning round." The pupa is described at length, but the curious "thoracic spiracle protector" is passed over so slightly that one would not suspect the nature or form of it, merely saying, "the pair of spiracles at the shoulders large and dark brown." *

The pupa which I had in 1887 was sent to Mr. Scudder, with no intimation of the species or its history, and he was asked what he thought it might be. His reply was: "The pupa you send seems very like one of the larger skippers, but I do not see any enlargement of the antennal tips, and think it must be a moth. The 'ear-like' projections are the thoracic spiracle protectors, which are entirely like this in *Tityrus*." As before said, Eudamus *Lycidas* pupa has the same sort of process.

I bred Erebia *Epipsodea* to imago in 1888, and found that here also the pupa was unattached. The end of the cremaster has a few short, straight bristles, both fewer and shorter than those of *Galathea*. Mr. Fyles bred *C. jutta*, and it pupated down in the moss, unattached. Mr. Scudder has described the mode of pupating of *C. semidea*, also down in the moss or among rocks, unattached, and neither of these have any bristles at all on the cremaster. This species is also described as curling up in a ring. *C. chryxus*, which I bred to pupa last year, is without bristles. It behaved like *Galathea*, pupating in the sod. Buckler figures

* The accompanying plate shows the larva of *Galathea*, Fig. 1, copied from Buckler; Fig. 2 shows the attitude on the sod when near pupation; 3 and 4, the pupa; 5 and 6, the last segment and cremaster, dorsal and side view, with the group of terminal bristles; 7, the single bristle; 8, the thoracic spiracle protector.

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Erebia *Blandina* as pupating upright in the sod, also unattached; and I have copied this pupa on the plate, 9.

More remarkable still is Buckler's figure of Hipparchia *Semele* pupa (iv). It looks like *Tityrus* also, but is stouter, and the ventral side protrudes as in that species and *Galathea* (Fig. 10). Mr. Buckler's own account accompanies the plate. He dug the larva out of the sandy ground near the sea shore. "The captured larva, on being placed under a glass on a pot with its native food, immediately burrowed in the sandy earth, and the few times it was seen on the grass were always at night. On the 23rd June I searched for the pupa and found it in a hollow space a quarter of an inch below the surface, the particles of sand and earth slightly cohering together, and close to the roots of the grass, yet free from them. The pupa was obtuse, rounded, turned and smooth, and wholly of a deep mahogany colour." That is a strange recital! An Arctic Chionobas may be compelled by the severity of the climate to live within the moss and pupate there, but here is a species in the temperate regions, at the level of the sea, burrowing in the sand like a cut-worm, coming out at night to feed and returning to ground cut-worm fashion, and pupating under the surface in a manner common to many families of the Heterocera, even certain genera of Sphingidæ.* Probably many other species and genera of Satyrinæ have larval habits such as I have related. Of the vast number of species but few are known in the early stages. Mr. Scudder says, p. 119: "We know of at least eight European species (besides *Galathea*), mostly referred to Satyrus, but some to Epinephele and Pararge as well, the chrysalids of which are not suspended."

We have in America a butterfly, *Ridingsii*, provisionally placed in the genus Hipparchia, but which is not congeneric with *Semele*, the larva and pupa of which may have the form and habits of *Galathea* or even of *Semele*. I have its larvæ now hibernating.

The Satyrinæ are a very numerous family, with many natural genera, and most of these have numerous species. Kirby, in 1871, made 80 genera, and as many species have been described since, and of making of genera, natural and artificial, there is no end, I dare say there are 150 genera of some sort in the books to-day. The butterflies are all or nearly

* "AGROTIS C. NIGRUM feeds by night on the tops of red clover, hides in the ground by day, pupates in a loose cocoon on top of the ground beneath rubbish, or even without any cocoon; but most Agrotids pupate in the ground. All the larvæ of the genus have the habit of curling up."—*French*. I sent Prof. French one of these plates. He writes :—"No. 10 is precisely as I have seen the Agrotis pupate."

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all feeble-bodied, feeble-winged, of weak and intermittent flight, and frequent woods and grassy spaces, loving the shade. "Distinguished by their peculiar flight, which is of a feeble, wavering, dancing character, and not long sustained; neither do the insects rise far above the ground. Wallace, in writing of the species found on the Amazons, says he does not 'remember to have ever seen any species rise four feet from the earth, while the greater part of them *do not exceed as many inches.*' Some genera of the allied Morphinæ are said by Wallace to be 'truly crepuscular, never flying by day except when disturbed. * * * They remain hid during the day in the gloomiest shades of the forest.'"—Scudder.

As before set forth, here are four genera, Arge, Hipparchia, Chionobas and Erebia, in which the preparatory stages of species resemble in habits and form the Hesperidæ and certain moths. The last two are Arctic or boreal. The American Erebias, *Epipsodea* and *Magdalena*—this last represented on the shore of the Arctic Sea by *Fasciata*, (see But. N. A, vol. iii, pt. vii for this,) the two evidently being forms of one species—fly at the extreme north, or on the summits of the loftiest peaks of the Rocky Mountains. Chionobas *Semidea* also flies within the Arctic circle, as far north as Cumberland Island, and in Labrador, but there are isolated colonies at two other points, namely, the summit of the White Mountains of New Hampshire, and the high peaks of the Rocky Mountains. *C. jutta* is boreal, being found in Labrador; but it reaches farther to the south than any other of its genus—to Quebec, Ottawa, and Bangor, Maine, where it flies at low elevations. Arge and Hipparchia are found inhabiting the temperate parts of Europe, and the first of these even crosses into Northern Africa. Erebia *Magdalena* and Chionobas *Semidea* live under the severest conditions. Mr. David Bruce says of *Magdalena* and its habitat: "It is found in the most uninviting looking spots it is possible for a naturalist to explore—black, barren, detached rocks, that look as if an immense peak had fallen and split into fragments; hardly a blade of grass or a patch of lichen to relieve the utter desolation. I have never found this species but among such broken rocks, varying from 12,000 to 14,000 feet elevation. The sun gleams out, and awakened into activity by its beams, comes *Magdalena*, flitting leisurely, then suddenly taking an upward flight, it soars around. Another of same species springs up from the rocks, the usual skirmishing chase ensues for a few minutes, the sun is again obscured, and the insects disappear as if by

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magic, and will not be seen until it is bright again. I have met with it from June 28th to July 18th." As Mr. Bruce searched for two seasons for this particular and exceedingly rare butterfly, this period of 20 days in in which he found it, may be taken for the duration of the species in its imago stage. It is not probable that the life of one of the individual butterflies lasts one week. All butterflies die speedily after copulation (♂) and laying of eggs (♀), even in temperate regions. Many species in the same regions come from pupa with eggs mature, and copulation takes place almost at once, often before the wings of the female are dry, and in one well-known case, *H. Charitonia*, often before the imago is out of the pupa shell. We may be sure that nature would allow of no loss of time at 13,000 elevation. The existence of the species must depend on getting the eggs laid and protected. Mr. Bruce is of the opinion that there is an annual brood of the imago. I myself had thought there could be but one every two years, from my experience with allied larvæ, which are excessively slow in growth My imagos of *Galathea*, as stated, showed 17 days between the emerging of the first and the last from pupa, and yet they were all hatched on same day. The 20 days spoken of by Mr. Bruce, as said above, represents the time in which the species was alive in the imago, not the life of one individual by any means. Spending therefore 51 weeks out of 52 in, or on, or under the ground as egg, larva, or pupa, one week in the imago, hiding among the rocks whenever the sun is obscured, and it is often obscured, or when fierce winds blow, and there must be very little time when a stiff breeze or a tempest is not blowing, the temperature every night, as Mr. Bruce tells us, as low as 30° Far., at the least, ice forming wherever there is a bit of water—is it possible to conceive an existence more unsuited for a creature dependent on sunshine than this *Magdalena* lives, imprisoned on those summits? Yet, the species must have lived so through untold ages.

For the history of *Semidea*, in New Hampshire, I will quote from Mr. Scudder, in his grand work, the Butt. N. E., pages 589 et seq: "These two butterflies (Argynnis *Montinus* and Chionobas *Semidea*) may be looked upon as the oldest inhabitants of New England, which followed the retreating ice sheet in its progress northward. They were the first of their tribe to fly over the barren fields of New England, where the earliest verdure began to follow the withdrawing ice, and moving with it, step by step, were at last, some of them, beguiled by the local glaciers in the

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White Mountain region, long after the main glacial sheet had left these mountains far in its rear, and until connection with the main body was finally cut off." And quoting Mr. Grote on this species and its ancient history: "They advanced behind the deceiving local glaciers, step by step, up the mountain side, pushed up from below by the warm climate, which to them was uncongenial, until they reached the mountain peak. Here, blown sidewise by the winds, they patiently cling to the rocks; or in clear weather, on weak and careful wing, they fly from stemless mountain-pink to blue-berry. Drawn into the currents of air that sweep down the mountain-side, they are forced downwards to be parched in the hot valleys below." Mr. Scudder continues: "It will be asked how it is possible that such delicate organisms as butterflies can maintain themselves *in such a bleak and inhospitable region* as the summit of the White Mountains, where a Greenlander would find it impossible to live in comfort, inasmuch as he would be exposed not merely to the cold, to which he is no stranger, but to the *fiercest and most biting winds, with an amount of humidity accompanying them which would seem to be almost fatal to existence.*" The author then speaks of the long larval period, during which the species is protected among the rocks and snow. Then continuing with the imago, it "invariably closes its wings back to back, and settles upon one side as if reclining, the *point of the wings away from the wind*, where it clings to the roughnesses of the rocks, and is seldom blown from its foot-hold. * * * In the imago state, *it cannot bear transportation so much as 3,000 feet vertically* to the base of the steeper slopes, at least if this transportation is effected in a rapid manner. *Indeed their efforts at flight under such circumstances are so pitiable* that it would seem very doubtful if the butterfly hurled deep down into the ravines by the fierce blasts which may at times catch it unawares could possibly remount the steep slopes. That such cases of destruction may occur with so feebled-winged a butterfly seems by no means impossible," etc.—the author relating how he had seen these insects swept over the cliff, etc. On page 145, we read also: "They can offer no resistance to the winds, and whenever they ascend more than their accustomed two or three feet above the surface of the ground * * * they are whirled headlong to immense distances," etc. He then relates how this butterfly escapes capture, "by edging its way afoot to the brink of a crevice," and dropping into same. And that he took three healthy females down the mountain on the railway train, and before half the descent was made they

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were visibly affected, and by the time the tree line was reached—elevation 4,500 feet—they were gasping for air. At 2,800 feet, where he was staying, he thought them dead, and finally killed them, as they "gained no strength at the end of twelve hours." Doubtless similar careful observations and experiments with *Magdalena* would reveal a similar history. Mr. Scudder, p. 144, thinks it probable that the larval stages cover two winters. If so, the imago is biennial, as *C. Bore* of Europe, is said to be: "*Bore* hibernates twice as caterpillar and changes to chrysalis in May, in the winter quarters of the larva, free, in sand, between roots of grass under the surface of the ground."—But. N. E., p. 126. That is, another species of this genus has the larval habits of a noctuid moth.*

The existence of *Magdalena* seemed as bad as bad could be, but these accounts of *Semidea* indicate a worse climate and therefore severer trials. These are two of the feeblest butterflies in the N. Am. fauna, and this sort of existence has endured at least since the glaciers retreated, and no one can guess how many years longer.† When we read that butterflies have come down from the Tertiary period unchanged, we may allow for *Semidea* a vast antiquity.

Members of the *Semidea* species dwell to-day within the Arctic circle, in Labrador, in the White Mountains of New Hampshire, and in the Rocky Mountains in Colorado, separated by vast distances. Mr. Scudder shows that the mountain colonies cannot exist in the low grounds, cannot even

* The history of *Semidea*, as related by Mr. Scudder, mostly from his personal observations, is worth the price of the whole work; and I recommend every person interested in butterflies to make it a part of their library without delay. I differ with Mr. Scudder radically about many things, the restriction of genera, the resurrection of obsolete names, the use of Hübner's Coitus and Tentamen names for genera and families, but in other important and essential points this work of his is and will forever remain unapproachable. The wealth of illustration is amazing, not only of the butterflies themselves, but of every part and organ of them, and what has never been attempted before except on a limited scale, the eggs and young larvæ are shown in greatly magnified and admirably executed figures. In any future system the eggs and young larvæ will form an important part. The time is coming when classification based on features of the imago alone will be thrown over, and the new arrangement will take consideration of all three of the preparatory stages. For these matters and the anatomical details, worked out with wonderful ability, and the life histories and distribution worked out with exceeding care, the Butterflies of New England will be a standard work, and no student can possibly get along without it. The edition is limited and the plates cannot be reproduced; therefore, I say to my friends, subscribe without delay.

† Mr. Geikie, in the Great Ice Age, p. 135, is of the belief that the last glacial period terminated 80,000 years ago, and began about 240,000 years ago.

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descend the peaks; therefore there cannot have been communication between these branches since the retreating ice stranded the two southern colonies. Yet they are not distinguishable from one another. Examples from Labrador, even also from Ungava Bay, lat. 59°, are precisely like examples from the White Mountains and Colorado, and in fact these three branches of the species are not known to differ by a scale or a hair.

(To be continued.)

DR. CHRISTIAN ZIMMERMANN.

BY H. A. HAGEN, CAMBRIDGE, MASS.

(Continued from page 57.)

The following is a list of the entomological works of Dr. C. Zimmermann:—

1. Monographie der Carabiden, Erstes Stueck, Berlin and Halle, 1831, 8vo., pp. 8 and 76, contains the family Zabroides, five genera, with twenty-six species; review in Oken Isis, 1832, vol. v., p. 539, vol. x, p. 1117; extracted in Silbermann Revue, 1833, T. I., p. 45-47. The author's copy belongs to the library of the museum.

2. Monographia Amaroidum.—The work was interrupted by the author's voyage to America. The library of the museum possesses out of Zimmermann's own library a few sheets, printed in Europe in 1831, in two parts (proof sheets). The work is written in Latin. First part, p. 1-48 (three sheets), the general description of the family Amaroides:—I. de capitis partibus, p. 5 (os, instrumenta masticandi); II. de trunci structura, p. 16 (collum, pectus, pedes, alae); III. de abdomenis segmentis, p. 31 (dorsum, venter, appendices); general division of the Adephaga and Carabidæ, p. 36, in 12 stirpes; de corporis partibus externis, p. 40, the plate (table 1) is not present, probably never printed, then follows the general description, p. 44, which gives the characteres sexuales (not finished), p. 48.

The second part (also not finished), Monographia Amaroidum, quotes the first part as:—Dispositio methodica nova Coleopterorum Adepha-

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gorum. The characters of the family (p. 1) are followed by the systema of the family in twelve genera (p. 11).

1. Leirus Megerle, p. 12, twelve species, four new.

2. Lioscelis, Zimm., p. 31, nine species, two new (not yet finished). The third sheet is by error marked the fourth, and the pagination, p. 49-60, is wrong, instead of p. 33-48.

I have given purposely a detailed account of the two papers, only known by proof sheets, out of Zimmermann's library, as they contain, indeed, the most elaborate account of the general characters of the family. The description of the genera and of the species, as far as contained in the papers, is very detailed.

The paper on Amara is quoted in my Bibliotheca II., p. 304, No. 2. It is in some way different from the Latin paper just described. It is published in German and translated in French, also the papers Nos. 3, 4 and 5. Besides those papers, after his death Dr. J. L. LeConte has published the two well known in the Tr. Ent. Soc., Phila., 1868, on Scolytidæ, and in 1869, synonymical notes on Coleoptera. Dr. J. L. LeConte's Scolytidæ, p. 149, says:—"Among the MSS. of my deceased friend, Zimmermann, I find several partially completed memoirs, which contain not only systematic ideas of much value, but descriptions of many new species belonging to our fauna." Nevertheless he has published nothing more of them, and I am informed by Dr. J. H. Horn that nothing more of Zimmermann's papers was found after Dr. J. L. LeConte's death.

The following report is given in a letter from Zimmermann to Th. W. Harris, July 4, 1853 (in the library of Boston N. His. Soc.), it must not be forgotten that the letter was written before Chapnis and Candeze appeared:—

What I have observed about the beetles, grubs and their use for a methodical synopsis I will subscribe here with a few words only, for the thermometer rises again about 100°.

COLEOPTERA.

A. Larvæ of 13 segments, full of folds, never with eyes.

1. Petalocera (= Lamellicornia), forming three sub-divisions, *(a)* containing *Oryctes*, *Melolontha*, *Copris*; *(b)* containing *Trox*, etc.; *(c)* containing *Lucanus*, etc.

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2. Rhynchophora, *(a)* containing *Hylurgus; (b)* containing *Curculio; (c)* containing *Brenthus.*

B. Larvæ of 13 to 14 segments (head and prolegs included, each for one segment), without folds, with or without eyes.

3. Tetramera, *(a)* containing *Capricornia; (b)* containing *Bruchidæ; (c)* containing *Phytophaga.*

4. Pentamera, *(a)* containing *Sternoxa*, (a) *Buprestidæ*, (b) *Elateridæ*, (c) *Cebrionidæ; (b)* containing *Cleridæ; (c)* containing *Lycidæ.*

5. Heteromera.

C. Larvæ of 13 to 14 segments (mostly 14), above scaly, swift footed, always with eyes.

6. Adephaga.

7. Rhypophaga.

8. Brachelytra.

I have directed all my powers upon the investigation of the larvæ. Up to this day, however, I did not discover any more or better distinctive characters than those given above, and which appear to contain all the external characters worthy to be trusted, for you know already that numbers of them change their dress and form with each moulting. I may remind you here of the curious transformations of the larvæ of *Meloe*, as investigated in the Linnean Transactions, vol. xx. These little creatures appear as frequently delineated, at first with long legs for swift running, which is necessary for them in order to reach their final abode; having accomplished that they become by degrees fatter and more sluggish, whereby, curiously enough, the length of their legs decreases. The apparent difference between the larvæ of *Buprestis* and *Elater* may be explained upon similar necessities, for the body of the larvæ of *Buprestis* is soft and necessarily so, living as it does in hard and unyielding substances, whereas the body of the larvæ of *Elater*, which lives in more damp, soft and cold substances, will find its stiff and hard dress more comfortable than it would a softer one. The larvæ of *Buprestis*, as well as that of *Elater*, are of a structure sufficiently similar to be placed in the same great division (B), and more similarity was not necessary, for the structure of the beetles themselves had to decide their systematic station.

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POPULAR AND ECONOMIC ENTOMOLOGY.—No. 2.

THE APPLE TREE TENT CATERPILLAR — THE AMERICAN LACKEY MOTH (*Clisiocampa Americana* HAR.)

BY JAMES FLETCHER, OTTAWA.

There are two kinds of caterpillars which every year commit serious depredations in our Canadian apple orchards, although they by no means confine their attentions to that tree. These are the larvæ of the American

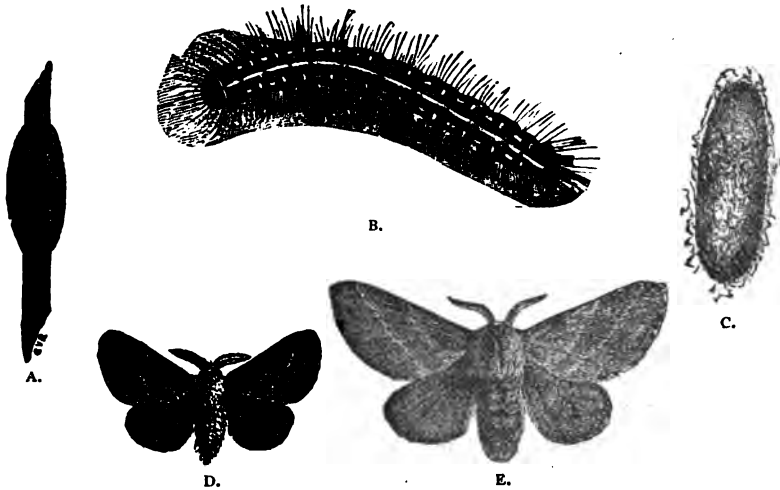

FIG. 1.

and Forest Lackey Moths, two species of brown moths which frequently fly into houses at night during July, and draw attention by their headlong, reckless flight, dashing themselves against the ceiling and the walls, and very often finishing up by getting into the lamp chimney. Speaking generally, there is a great resemblance between these two insects in appearance and habits, and the same remedies are applicable for both; when examined carefully, however, they differ considerably in all their stages, and may be easily recognized. They belong to the *Bombycidæ* or

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Spinners, a family which contains the silkworm moths and several other thick-bodied, hairy moths, with large wings but small heads, bearing comb-like antennæ and having the mouth parts imperfect, or as in those now under consideration not developed at all. The caterpillars of the *Bombycidæ* are usually hairy or tufted, and when full grown spin a cocoon for the protection of the short, thick chrysalids.

At Fig. 1 the different stages of the American Lackey Moth are given. This species appears in the perfect state in the beginning of July, about a week earlier than the other species referred to above, which is known by the name of the Forest Tent Caterpillar *C. disstria* Hüb. (*C. sylvatica* Har.)

The American Lackey Moth is a pretty species of a dull but rich reddish-brown colour, having the upper wings crossed obliquely by two clear, whitish, parallel lines. In rare instances these show faintly on the lower wings also. The fringes of the wings are chiefly of the same colour as the oblique lines. The space enclosed between the light lines is paler than the rest of the wings in the males, but of the same colour or rather darker in the females. On the under side, all four wings are crossed by a well-defined, irregular, whitish bar. The perfect insects having their mouth parts undeveloped partake of no food, but devote the whole period of their short lives to the perpetuation of their kind As soon as they have paired and the females have laid their eggs they die. The eggs are deposited in rings upon the smaller twigs of various trees, usually within a short distance of the tips. Each egg-cluster contains from 200 to 300 eggs, which, when laid, are covered with a liquid glutinous substance which soon dries and cements them firmly together, and protects them from the weather.

A surprising point in the life history of these insects is that about a month after the eggs are laid, the young caterpillar is fully formed inside the egg and it remains in this condition all through the winter, only eating its way out from the egg in the following spring when the leaves expand. Immediately upon hatching the young caterpillars consume the glutinous covering of the eggs, and then lose no time in attacking the foliage. They at once begin the construction of their tent, which is a web of fine silk, spun in the nearest fork of the twig upon which they were hatched. This tent is increased in size as the caterpillars grow, and if left undisturbed is sometimes nearly a foot in diameter. The caterpillars are very regular in their habits, marching out in regular procession, each following close behind the

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one in front of it. From the habit of the larvæ of this genus of marching out to feed in bodies they are known in Europe as "Processionary Caterpillars." When their appetites are satisfied they return again to their tents to rest. They do not feed at night nor in stormy weather. They usually do not leave their tent until after nine in the morning, and have all returned before sundown. They are generally inactive in the middle of the day.

When full grown the caterpillars are two inches in length, and beautifully marked with black, white, blue, yellow and brown in the pattern shown in Fig. 1., B. The continuous stripe down the back is white, and serves as a distinctive mark by which this species can be known at once from the Forest Tent Caterpillar—Fig. 2—which has this dorsal stripe broken up into spots. This latter also differs in not constructing a tent, but merely spins a mat of silk on the side of a tree, or upon one of the large branches, on and near which it lives, more or less, in community; but it has not the same social habits as its relative. Just before they spin their cocoons, the caterpillars wander about very much, seeking for a suitable place. The cocoon, Fig. 1., C., is greenish yellow, and contains a powdery material like finely ground sulphur. The moths emerge in about eighteen or twenty days after the cocoon is made.

FIG. 2.

Remedies.—The most successful remedies with these insects all come under hand-picking. During the winter or early spring the egg-clusters can be easily collected and destroyed; they are always laid upon the small twigs and near the tips, so that if a dull day be chosen they can be easily detected against the sky, and can then be cut off and burnt, when, of course, the trees are exempt from attack, until eggs are laid again next year. If this precaution is neglected, the nests, which are conspicuous objects before the foliage is fully expanded in spring, must be cut off and destroyed. An invasion from neighbouring trees can be prevented by tying a strip of cotton-batting round the trunk, which the caterpillars have difficulty in climbing over.

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THE LARVA OF LIMACODES INORNATA, G. & R.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Larva.—Elliptical and much flattened, the sides rising slightly to two dorsal ridges, only a little elevated, these ridges diverging somewhat towards the anterior and posterior portions of the body. Around the outline of the body is a series of flattened pointed projections for the last eight segments, furnished on their sides with fine, short hair. These projections occur on each segment after the fifth, the two on the last segment somewhat longer than the others, and directed nearly straight backwards. Colour green, a reddish line on the angulated outline of the anterior segments; the dorsal ridges marked with a narrow yellow line, which is interrupted between two dorsal yellow spots with red centres. These spots are conspicuous though small.

Food Plants.—Maple, wild cherry, hickory, etc. Like most of the Cochliinæ a very general feeder.

A good figure of this insect is to be found in Harris's Entomological Correspondence,* and in the text Dr. Harris says: § [The larva is] "in form somewhat like an *Oniscus*, being oval and flattened, with lateral tooth-like appendages fringed with hairs. General colour green, with lateral rows of minute, ocellated spots, each pupillated with a black dot; a dorsal row of dark spots, with two of a rich scarlet colour * * * This insect does nor sting."

The difference between this larva and that of *Limacodes scapha* Harris† is very marked. While *L. scapha* is a thick larva, resembling a lump of some substance adhering to the leaf; the present species, as above stated, is much flattened, and furnished with its remarkable tooth-like projections. In fact, before the imagines of *L. inornata* were developed, I had no idea that the insect could be congeneric with *L. scapha.*

Two males, raised from these larvæ, differ somewhat from the original description by Grote and Robinson,‡ so that, to them, the name of "inornata" hardly applies. In this form the secondaries are somewhat

* Entomological Correspondence of T. W. Harris, edited by S. H. Scudder, 1869. Plate II., Fig. 7, and Plate III., Fig. 6, § *ibid*, page 176.

† Figured, *ibid*, Plate III., Fig. 8.

‡ Lepidopterological Contributions page 22, from Ann. Lyceum Nat. Hist., of New York, 1886.

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darker above than in the typical insect, while the primaries are variegated by a ferruginous brown basal shading, continued narrowly along the internal margin and connecting with a similarly coloured band, extending, on its inner side, parallel with the external margin, but its outer edge starts from the outer margin above the internal angle and runs obliquely inward, so that the band ends in a point before reaching the costa. The upper part of this band, as well as the outer part of the basal shading, has a purplish tint. Fringe dark brown.

I should judge this to be the ordinary ♂ of L. inornata, in New York. A single ♀, also raised from these larvæ, fits the description above referred to.

CORRESPONDENCE.

ARZAMA OBLIQUATA.

Dear Sir: In reply to Mr. Moffat and Mr. Kellicott, I wish to say that both of these gentlemen are mistaken in saying that the larvæ of *Arzama obliquata* go to the shore in the fall of the year to stay over the winter. On the 25th of November last my friend, Chas. P. Mackisney, of Arlington, N. J., and I took a walk through the meadows at Arlington, which cover from fifteen to twenty square miles. We did not find any signs of *Arzama* except in one place about two hundred feet square, and there in every reed we cut we found a larva, but we had to cut below the surface of the water to get them. I went out to the meadows again to-day (the 22nd of February) in order to get some larvæ to send to Mr. Moffat and Mr. Kellicott, and I found some about four hundred feet from the shore, where I had to cut the ice to get to the bottom of the reeds. I got four larvæ and shall send them to these gentlemen in order that they may see for themselves that I was right in my statements (C. E., xx., 119). I also wish to state that if they require further evidence I should like them to come to New Jersey, and I will take them to a place where they can get a car load of cat-tail reeds with larvæ in them throughout the whole winter. I do not think that Dr. Riley is correct in saying that the female lays her eggs in masses. I have always found them deposited singly, and I do not think it likely that they would be laid otherwise, because it would be impossible for a number of larvæ to live in one reed.

H. H. BREHME, Newark, New Jersey.

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ARZAMA OBLIQUATA.

Dear Sir: On reading Mr. Kellicott's communication in CAN. ENT. for February, 1889, I learn that his observations concerning the habits of *Arzama obliquata* G. & R. larvæ, do not agree with mine. Up to the 26th of January of the present year I held the same opinion as he does, and I was not a little bit surprised on hearing of its being a winter feeder. Requiring some lining for a few packing boxes which I was preparing to send by mail, I had occasion to go to the marsh for some stalks (commonly known as rushes, but by botanists, I suppose, as *Typha*), which make a convenient substitute for cork. The very first stalk that I cut showed that larvæ had been at work. This at once brought to my mind the recent communications of which Mr. Kellicott writes, so I began an investigation and was much surprised at the result. Besides a number of empty pupæ and a mature larva (which I always find in the form of a loop, with one end shorter than the other) at rest for the winter, down in the thick part of the stalk, I found three immature larvæ at full length up in the small part and surrounded by evidence of recent feeding. During my nine or ten years of collecting, I have raised both *Arzama obliquata* and *diffusa* from mature larvæ found on shore in old wood and other rubbish, mostly every year. Some I have found as early as November 3rd, and others in every month until May. Having always found them pretty plentiful on shore, I was of the opinion that it was their habit always to come there to transform, but my observations on the above date convince me that those I had hitherto found were only wanderers, while the main body remain at home to undergo their transformation. As for their being single brooded here I agree with him. I have found two or three moths late in July, but those I should say came from larvæ which passed the winter in the immature state, rather than from eggs laid that season.

March 9th, 1889. JAMES JOHNSTON, Hamilton, Ont.

NOTES.

We are glad to learn that Mr. John B. Smith, of the National Museum, Washington, has been appointed State Entomologist of New Jersey. He will enter upon his new duties on the first of April, and will reside at New Brunswick, N. J. While we congratulate the State upon securing the

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services of so eminently capable an entomologist, we trust that Mr. Smith will find his new work congenial and satisfactory, and its accessories lucrative and comfortable.

The following amendment has been made to the Agriculture and Arts Act during the recent session of the Ontario Legislature :—"Section 67 of the said Act is amended by adding thereto, after sub-section (2), the following : 'Provided, however, that the Entomological Society of Ontario shall, at its annual meeting, group into five divisions the agricultural divisions enumerated in Schedule A. to this Act, and shall elect one person from each of such five divisions (who shall be a resident of the division he represents) as directors of the said Society.'"

The New York Academy of Sciences is making an effort to erect a suitable monument in Trinity Church-yard in memory of the great ornithologist, John James Audubon. About $900 has been collected, but the plans accepted call for from $6,000 to $10,000. It is earnestly hoped that each scientific society in America will contribute an average amount of $100 through its members, and thus enable the enterprise to be at once completed. Each subscriber of a dollar or more will receive a copy of a print from Cruickshank's celebrated portrait of the great naturalist suitable for framing. Remittances from our members may be sent to Mr. W. E. Saunders, 240 Central Ave., London ; or to Dr. N. L. Britton, Columbia College, New York.

The following is the list of the officers of the Kent Scientific Institute, of Grand Rapids, Mich., for 1889, which is incorporated for the promotion of scientific education and the establishment and maintenance of a natural history museum :—President, E. S. Holmes ; Vice-President, W. A. Gruson ; Recording Secretary, C. W. Carman ; Corresponding Secretary, E. S. Holmes ; Treasurer, C. A. Whittimore ; Director of the Museum, W. A. Gruson ; Curator, C. W. Carman ; Librarian, E. L. Morely. Board of Directors:—Wright L. Coffinberry, W. A. Gruson, Samuel L. Fuller, E. S. Holmes, J. W. Jones, C. A. Whittimore. Officers of the Board :—Chairman, W. A. Gruson ; Secretary, E. S. Holmes ; Treasurer, C. A. Whittimore.

Mailed April 8th.

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DESCRIPTION OF THE PREPARATORY STAGES OF ARGE GALATHEA, LINN., WITH NOTES ON CERTAIN SATYRINÆ.

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(Continued from page 71.)

How then can Mr. Scudder claim that this feeble relic of the tertiaries, stranded, as he tells us, on the loftiest peaks at east and west at the close of the glacial period, unchanged in all respects since that, its imago showing itself but once in two years, the individual living at most but a few days, always in tribulation and peril, saved only from extinction by its acquired habits of dropping into a crevice, or of clinging to the rocks by the feet, its wings of scarcely any use whatever, but a constant source of danger—that this miserable creature stands at the head of its genus, its sub-family, its family, of the American fauna, and in fact of the world, the ideal butterfly !*

The mere statement of the proposition that such a tribe, creepers along the ground, avoiding sun-light, allied to the moths at every stage, often with habit of moths rather than butterflies, have high rank in the order, and that the weakest member of the tribe—the one which has suffered most by isolation and privation—is the highest of all, carries its own refutation.

When a process of reasoning leads to an absurd conclusion, there is a flaw somewhere. The facts may be mistaken, or wrongly presented, and, in either case, the inferences attempted to be drawn from them may be without justification.

Mr. Scudder is compelled to allow, that in three stages out of four, the Satyrinæ are nearer the Hesperidæ and the moths than to other butter-

* We have the expression "the highest butterflies," meaning the Satyrinæ, repeated endlessly, sometimes twice on one page, when "Satyrinæ" would answer every purpose. It seems to me the author of the work, appealing to the reason of his readers, makes a mistake in thrusting his opinions before them so persistently. If the arguments fail to convince, what he calls by one name, will be thought to deserve quite another.

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flies, namely: in the egg, larva and pupa. "In certain features, the Satyrinæ show some *curious resemblances* to those of the Hesperidæ. * * * The eggs of the ribbed species *closely resemble* those of the Hesperidæ in general appearence. The caterpillar, at birth, has a *similarly large and striking head*, and occasionally the terminal segments of the body *are armed with much longer cuticular appendages* than elsewhere—a common feature among the Pamphilas; the mature caterpillar is sluggish, with a somewhat flattened belly and short pro-legs, giving a limaciform body, which is clothed with pile only; the chrysalis *is unusually rounded*, and *occasionally is not suspended*," &c.—But. N. E., p. 120. In his "Butterflies," N. Y., 1881, he says:—"It is one of the *most curious features* in the structure of butterflies *that its highest*," and here he means the Satyrinæ, "*and its lowest should resemble each other in so many minor points.* For instance, the *tone and colouring on the wings* of many Satyrinæ, as well *as the position and general nature of the sexual marks on the front pair* (of wings) of some males, find a close counterpart on the wings of some Skippers (Hesperidæ). So also the chrysalids of the Satyrinæ are among *the simplest, most rounded and compact in the whole family, approaching in this respect the lowest butterflies.*" That is, not only are there "curious resemblances" in the three stages, but very important ones in the fourth stage. Speaking of the same things in But., N. E., p. 120:—"That these peculiarities have some phyletic meaning it is impossible to doubt;" but what it is, the author does not venture to conjecture. To me the meaning is plain enough. They indicate the close affinity of the Satyrinæ with the "lowest" butterflies. "Nevertheless," we are told, "in all the prime features of their organization, the Satyrs outrank all others." They must be extraordinary features to outweigh all these "curious resemblances," these "peculiarities," with their "phyletic meaning," and to raise the nearest relatives of the Moths to the head of their order. As is natural, the author of these volumes is inclined to make the most of every point that can be construed to tell in favor of his hobby, and to make little of whatever tells the other way. If nothing else can be said, we shall hear that any given case which presents itself obstructively "is entirely explainable as an instance of reversion." In this way are got rid of, or slurred over, some very important facts; thus, "the only case among the higher butterflies" (higher this time means above the Hesperidæ), "where a cocoon, properly

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speaking, is made, is in the sub-families most closely allied to the Hesperidæ, among the groups of Parnasinæ and Anthocharinæ." (I very much doubt any cocoon in an Anthocharis, myself); quite ignoring the cocoon of *Semele*, as figured on our plate. "And, again in exceedingly feeble instances, where the necessities appear to be overwhelmingly great, among the higher Nymphalidæ, which have lost even the last remnant of the cocoon of moths, viz., in some of the Satyrinæ, which lack cremastral hooks, and undergo their transformations ordinarily in the rudest form of a cell, which they can construct above or at the surface of the ground by the mere movements of the body and the spinning of one or two threads of silk." The "necessities" may have been overwhelmingly great in the case of *Semidea;* but what of *Jutta*, a species of the same genus, living in Maine, and of *Semele* and *Galathea*, at the level of the sea, in temperate Europe! Among the great sub-family Satyrinæ, with its multitude of genera, of nearly all of which the habits at pupation are unknown, it is probable enough that the heterocerous style of pupation is common. To refer such cases, in a group claiming to be farthest removed from the moths, to atavism from the moths, will not do. There are too many of them. And the same sort of ancestral traits crop out in the color and sexual markings of the imago, in the egg and larva, as well as in the pupating habit.

In the "Butterflies" three "prime features," as they are called, are given, viz: The pupating habit, with the flat ventral surface of the pupa among the Nymphalidæ, the papillae on tongue, and the atrophy of the fore legs. In the But. N. E., so far as I see, the papillae prime is dropped, as well it might be. We are told in the former work, p. 255, that this feature consists in the complication of the structure of the papillae of the tongue. In the Papilios and Skippers "these are merely minute tubercles, * * * seldom rising much above the surface. In the Lycænidæ they are longer and more frequent, while in the Satyrinæ they are often half the breadth of the tongue in length, closely crowded together, and often trifid at their tips." (Of course this feature can only be made out by a powerful microscope.) How one of these conditions is an advance on the other is not explained, and I will venture to say is not explainable. Each species of animal, mammal, butterfly, or what not, has a tongue suited to its habits. A cow or a sheep has that organ adapted to grass feeding, a giraffe has one that is half a yard long, and prehensile at that, and feeds off the tree tops; but whoever heard that the

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giraffe was exalted because of its tongue, or of the sensitive papillae! If a Lycænid butterfly, expanding half an inch, has papillae on his tongue twice as long in proportion as his great neighbour Papilio, he probably has need of them, and it is pleasant to think he has got them, and is comfortable, and his gastronomic enjoyment big for his size. Surely that "prime feature" does not outweigh the "curious resemblances" spoken of as running through the whole life history.

The resemblance between the pupating habit of the Papilionidæ and the Hesperidæ must be a very obscure and distant one, if, as is stated in B. N. E., 72, it has been observed by no author save Mr. Scudder. The facts have been known from the day of Linnæus to every systematist; but no one has thought of any particular resemblance between the styles of pupating. And now that Mr. Scudder expatiates eloquently upon it, I, for one, fail to see the point. There are attachments of the pupæ that are clear, but they are very different. But allowing all that the author claims, inasmuch as he denies that he has ever said that the Papilionidæ were evolved from the Hesperidæ, one of these modes of attachment cannot have grown out of the other; one is no advance on the other. It is held that both families were evolved out of a "common stock," but what feature that stock had no man can tell.* It may not have been a moth; but the moths and butterflies may both have arisen independently from something else and now unknown. Any resemblance, therefore, whether distant or near, must be charged to the conditions and environment when the types of these families first appeared, and of that we can and shall know nothing. "The necessities" may as well have been "overwhelmingly great" in this case as in the one cited by Mr. Scudder, and being the same for both types, there may have resulted a form of attachment suited to each, and bearing some resemblance. But this involves no relationship. In other words, resemblance is not identity, nor does it imply identity.

As the argument runs, the moths pupate inside a cocoon, with no

* I am informed by Prof. J. A. Lintner that suspension of pupa is very rare among the moths, but that cases occur in which certain members of a family are suspended by the tail alone, and others of same family by both tail and girdle. "In the Geometridæ, the pupa of the Ephyridæ is suspended by the tail, and in some of the species there is also a transverse girdle as in the Papilionidæ." That is a queer state of things if one mode of suspension is more advanced than the other, or than none at all. Among the moths what are called the higher families are not suspended. Some pupate naked, some in cocoons, and neither mode implies rank.

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attachment, or with no cocoon, in or on the ground; the Hesperidæ in a folded leaf, or in two or three leaves brought together, having the tail of the pupa attached to the end of the case by a Y-shaped thread, and the body held by another Y-shaped thread (But. 256). The Papilionidæ and Lycænidæ weave "a carpet of silk" by which the hooks of the tail are held fast, and spin a real girdle of many threads, into which they thrust head and anterior segments. But, in the Nymphalidæ, there is no girdle, and the pupa hangs by the tail from the carpet of silk. Finally, as we have seen, many of the Satyrinæ weave no carpet, indeed have no hooks by which the pupa could hang, and so pupate naked in or on the ground, or in some cases, as in *Semele*, in a cocoon. Others that do not make a cocoon, spin threads by which leaves are girded about them, a style which Mr. Scudder calls a cocoon "by courtesy," as Erebia *Epipsodea* and some examples of *Galathea*. All these last, therefore, behave in the manner of the moths.

Oddly enough, Mr. Scudder has got himself in a state of mind to claim that these unattached pupæ have reached the greatest advance of all. "We see, therefore, a regular progression from the lower to the higher butterflies, in the loss, first, of the cocoon, next, of the girt; and, as if this were not enough, some of the highest butterflies have even lost the last remnant of silk and fallen to the ground." That is to say, a reversion to the habits of the moths is an advance in grade. Continuing: "As if to show that the suspension by the tail alone is a stage beyond that of hanging by tail and girdle, we have a clear proof that all the Suspensi have passed through the stage of the Succincti, since *the straight ventral surface of the abdomen*, assumed perforce by the Succincti when they left the cocoon stage, and became attached to hard surfaces, *still remains in the chrysalids of the Nymphalidæ*" (these italics are Mr. Scudder's), "where it no longer serves any purpose—as clear and striking an indication that the Suspensi outrank the Succincti, as that the pupa is higher than the larva."—But., 258.

I deny the fact alleged, that the pupæ of the Papilionidæ, which being the first to leave the cocoon stage, and "perforce assumed" a flat ventral surface, have that sort of a surface. I never saw such a thing in one of the Papilioninæ; they are all rounded, as in *Turnus*, or rounded and bent back in the middle, as in *Asterias*, *Troilus* and *Philenor*. In many, as the whole of *Turnus* group, the dorsal side is straighter and flatter

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than the ventral. Among the Pierinæ, the pupæ of some of Pieris, as *Rapæ* and the *Napi* group, have a tolerably flat ventral surface, others of the same genus do not. And Neophasia, Anthocharis, Callidryas, Terias, Colias, Nathalis, all which I know well, have anything but a flat ventral surface. Among the Nymphalinæ, many of the genera have no such surface, as Argynnis, all the Vanessinæ, Limenitis, etc., etc. The Heliconinæ do not. And, admittedly, the Satyrinæ have pupæ "among the most rounded in the whole family." Moreover, among many of the Satyrinæ the dorsal side is as much flattened as the ventral. The supremacy of the Satyrinæ, and with them the Nymphalidæ, cannot be proved from the shape and conditions of the pupa any more than from the papillae.

The third prime feature consists in the extreme degree of atrophy of the fore legs of the imago. The Hesperidæ have six walking, useful legs; the Papilionidæ the same number. The Nymphalidæ, however, have in both sexes but four walking legs, the first pair being deformed, atrophied, useless for walking, and, so far as is known, for any purpose whatever. It is exactly the sort of phenomenon not very infrequently seen in the genus Homo, but here a crippled or atrophied limb has never become a hereditary character. It certainly would not be regarded as a mark of elevation. How atrophy of the legs originated in the butterflies no one can tell, but perhaps by accident in a single member of the type form, and became perpetuated in a family. In the Lycaenidæ, we are told, But., 254:—"All the legs of the female are alike, but the front legs of the male are variously aborted." In the But., N. E., 203:—"As soon as we approach the Lycaenidæ, we notice signs of an approaching abortion of the fore legs, but only in the male;" described as slight; but is greater in the Lemoniinæ. It affects both sexes in the Nymphalidæ, but not in one of the sub-families, the Libytheinæ. These have six good legs in both sexes. And, in the Satyrinæ, the deformity is the most extreme of all. Indeed, unless the front pair of legs should drop off, it is not easy to see what more could be done in that direction. A disfigurement is not generally regarded as a sign of beauty, though tastes do differ. In certain valleys in Switzerland, he who can show the most enormous goitre is the pride of the district. Atrophy of limb, if it prevails throughout a family, may properly be held to be a mark of degradation. It is a phenomenon not confined to any particular order of

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insects. There are moths with atrophied wings and legs, carried to a surprising degree; and plenty of instances among the Coleoptera, but few persons would call the loss of essential organs a mark of "aristocratic distinction," as Mr. Scudder does on p. 74, But. N. E. One great family of butterflies is neither fish nor flesh. One sex of a Lycaenid (including the Erycinids) has six useful legs, and is, therefore and thereby a degraded creature, almost, or quite as "low" as a Papilio; but, its mate has its fore-legs always deformed, often utterly crippled, and, therefore and thereby, it is separated from its female, fit company for the "aristocratic" Satyrs! The argument on legs is not tenable. In fact it seems remarkably like nonsense. Deformity can have no ranking value, unless to mark degrees of degradation, and no argument based on the legs of the imago, no matter what their condition, can outweigh that based on every one of the four stages of the insect.

I put the question to a great authority on biology, one whose praises are sounded in both hemispheres, who, moreover, is thoroughly acquainted with Mr. Scudder's argument: "Is atrophy of legs a mark of development?" and the answer came: "Atrophy is not a mark of development." On that rock I stand.

Mr. Scudder's hypothesis of the evolution of these families is obscure, because the language used in different places conveys very different meanings, and, anyway, the hypothesis is peculiar. In But., 244, we read: "Doubtless the Skippers first separated from the common stock; the other families appear to have diverged simultaneously from each other soon after their common separation from the Skippers;" and a diagram presented on page 246 is explained thus: "The position of the main branches and their divisions is supposed to indicate the relative time at which the groups diverged from each other, or from the main stem, and *the height which each branch attains the relative perfection of the highest members of that group.*" In accordance with the author's prepossessions, the stem which is terminated by the *Satyrinæ* is highest of all, in fact six and a-half inches long, evidently limited only by the length of the printed page, and goes straight up from the base (that is, from the "common stock," while the Skippers diverge from the stem at half an inch from the base, and the Papilionidæ and Lycænidæ at another half inch simultaneously, one on one side of the stem, the other on other side. (That is, as if from a setting of hens' eggs were to issue humming birds and eagles.)

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The Nymphalidæ begin to branch at an inch and a-quarter above the Papilio, first coming the Libytheinæ; then at another inch the Nymphalinæ, and above them the Satyrinæ, at two and a-half inches. This two and a-half inches "indicates the relative perfection" of the Satyrinæ over the rest of the Nymphalidæ. The "perfection" of the Satyrinæ to the Papilionidæ is as 6.5 is to 1. Truly a parlous elevation for the giddy *Semidea* and its peers! Anyone can draw a diagram, and if I were to use the one made by Mr. Scudder, I should put the Satyrinæ at the first branch above the Skippers, and the Papilioninæ at the top, and the proportion of perfection would be for the latter as 6.5 to 1 of the other. Mr. Scudder assures us that all the Suspensi have been Succincti, and that the evidence "is clear and striking," but his only witness to the fact is discredited. As the moths, in general, have no attachment at all, if the moths are indicated by "the common stock," it is not clear why the Papilionidæ were "perforce" obliged to assume the girdle and button on leaving the main stem. The next stage to no attachment would seem likely to be the single attachment, but whether that was *perforce* assumed we have no means of knowing. It would also seem that the double attachment is the widest departure from the condition of no attachment at all, to be reached after the longest period of time, instead of the shortest. That from no attachment a sudden leap should be made to a double one and then come back to a single one, to culminate in none at all, as it began, is an unreasonable proposition. To me it seems clear that the condition of no attachment found in so many Satyrinæ is closest to the habits of the moths; the single attachment or button comes next, and the double attachment is the final outcome, "showing the perfection of the highest members of the group," namely, the Papilionidæ. Mr. Scudder tells us, and this time we concede the reasonableness of the proposition, that "it is unphilosophical to accord high rank to any group for a single characteristic, especially when, in nearly all its other peculiarities, it evinces its low origin."—But., 250. On this ground the scheme of elevating the Satyrinæ very properly fails.

But, while the diagram cited and the language sometimes used, would give the impression that the author did not intend to make one family evolve from another, other language certainly implies that this did take place, that what are called the higher families all passed through the stages of the lower, and in evolving sloughed off the lower class of habits

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more or less completely, till an "aristocratic" perfection was reached in the Satyrinæ. "The Hesperidæ have epiphyses; the Papilioninæ the same; in the closely allied sub-family, Pierinæ, the epiphyses disappear." —But. N. E., 73. "*There is the series, leading from the Hesperidæ in a direct and unbroken course through* the Papilioninæ, Pierinæ, Lycæninæ, Lemoniinæ *to the Nymphalidæ*, and *culminating* in the Satyrinæ" p. 74. That can mean nothing else than a sort of fishing-pole style of evolution, in which every joint proceeds from and was inclosed in a preceding one. That involves greater difficulty, even than the other plan. The big Papilio is to come out of the little Hesperian, the tiny Lycæna from the big Papilio, the robust and often great Nymphalid from the tiny Lycænid, and the series is to culminate in a weakling Satyrid, aristocratic, if at all, only in the sense of being effete, exhausted, "petered out."

Mr. Scudder insists strongly on the two evident series—one, of the style of pupating; the other, of the condition of the legs. But, what if these series are imaginary? The pupation begins and ends with the moths, and is in a circle, as I have shown, and, therefore, is not in a series. Let us see about legs; first, six good legs; next, slight atrophy in the fore-legs of one sex; then a little farther atrophy; next, six good legs in the Libytheinæ; then complete atrophy in both sexes, and at last extreme atrophy. Using the diagram before referred to, in which "the height which each branch attains, indicates the relative perfection" of the several groups, the whole length of the stem being 6.5 inches; we find the Papilionidæ at 2 inches, the Lycænidæ at 3, the Erycinidæ at 3.25; the Libytheinæ, having six legs, must be rated at 2; the Nymphalinæ 4.25; the Satyrinæ 6.5. This will then run 2, 3, 3.25, 2, 4.25, 6.5. The mathematical name for this sort of series I do not find, but I think it is what is called the illusive—such stuff as dreams are made of. Not substantial enough to base an argument on!

Another thing one would like to have an explanation of. If there ever did arise a tendency towards deformity, and the deformity was a development, why, in the Lycænidæ, it halted at a slight degree, and left all the species of this great family, divided into hundreds of genera, in exactly the same condition? Why it advanced a bit farther in the Erycinidæ and halted, and why both these families have halted for these myriads of years? Why they are not as perfect, in all respects, as the Nymphalidæ, with but four good legs in both sexes—four legs being

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the test of perfection? Why, in the Libytheinæ, part of the Nymphalidæ, there are six good legs in both sexes, though they evolved from the tainted Lycænidæ? These little difficulties will thrust themselves into notice when surveying Mr. Scudder's great scheme. It is very odd that the disease we are talking of should have burst out with virulence one step beyond the healthy Libytheinæ, and have swept all before it to the Satyrinæ, who yet have managed somehow to live through the 800,000 years.

There is no trace of butterfly life back of the tertiaries. The formation, next below that, is the cretaceous, adverse to butterfly beginnings. Now, the beginning of the tertiaries is estimated by geologists as somewhere about 800,000 years ago. All of a sudden the shales are full of insects, and we learn by Mr. Scudder's "Fossil Butterflies," 1875, and by his later papers, that the very earliest butterflies, whose remains are found, were closely like what we see to-day, the same families and subfamilies, so far as the examples go, which are recognized now. In the Fossil Butterflies, nine species are treated of from the Eocene and Miocene. Of these nine, two belong to the Pierinæ, one to the Parnassinæ, four to the Nymphalidæ, and two to the Hesperidæ. Of the four Nymphalidæ two belong to the Satyrinæ, and one of them is stated to be very close to Debis (Enodia) *Portlandia* of the United States. The other to be nearly allied to an existing Bornean species. We read, page 83 :—"Our present knowledge places the apparition of butterflies towards the end of the lower tertiaries." It appears then, that on the earliest horizon the "highest" butterflies, as Mr. Scudder esteems them, were living side by side with the "lowest." In the next horizon we find a Hesperid, a Pierid of a genus used in the Butt. N. E., viz., Pontia, and a Nymphalid, also belonging to one of Mr. Scudder's genera, Eugonia, which he created for Grapta *J. album*. Since 1875, the American tertiaries have yielded seven other butterflies, of as many species. One is a Pieris nearly allied to *P. Rapæ*; five are Nymphalinæ, and one is a Libythea; this last is so well preserved that its legs are clearly to be seen, and Mr. Scudder says that "the fore leg is of the same structure as in the genus to-day."—B.N.E., 759. That is, it has six walking legs, though all the rest of the Nymphalidæ have but four. Evidently on the leg classification it is a black sheep, and should be hustled out of the Nymphalidæ. Further, we are told that in one of the Nymphalinæ the legs show that "the atrophy of the fore legs had reached the same

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stage which it now possesses."* It appears, then, that while some genera are extinct, others are represented by modern genera very near them, and two belong to genera in use to-day. But the families and sub-families, even to the aberrant Libythea, were as sharply defined as they are to-day. Every family recognized by Mr. Scudder is represented, except the Lycænidæ, but their absence is accounted for by reason of "their exceedingly delicate structure and small size;" and it is added, "but there are intimations of the presence of some of their caterpillars in amber," which is a product of the tertiaries. And there is not a species about which there is a doubt as to what family and sub-family it belongs. The neuration of wings, the legs, palpi and antennæ were just as now. It is proved, therefore, so far as there is any evidence at all, that since the Eocene, the families and sub-families of butterflies have not changed an iota. Mr. Scudder is happy in the poetical quotations prefixed to his chapters, and he might have put over the one on fossil butterflies, "Such as creation's dawn beheld, we see thee now." New species have been evolved and new genera, but no new families. Of sub-families we miss *that of the Papilioninæ*, whose absence, considering their size and stout texture of wing, and especially if they were among the first to evolve from the "common stock," and, therefore, were always present when any butterfly at all was flying, is remarkable. If they were really the latest to develop, we can understand their absence.

From the beginning of the tertiaries there was a steady advance in the grade of mammals and birds. The supposed ancestors of existing species in these classes are found there, new types manifesting themselves as the period progressed. The families are not those of to-day, but one has developed into many. This very week there is going the rounds of the papers a description of the mammal Phenacodus-primevus, an animal both herbivorous and carnivorous, from the Eocene of Dacotah, which Dr. Cope considers the ancestor of the elephant and giraffe, the plantigrades, the carnivora and hoofed animals of to-day. But, in the butterflies, there is no evidence of any change whatever.

The hypothesis, advanced by Mr. Scudder, calls for a duration of time which is inadmissable. It is a problem in the Rule of Three; if butter-

* If, as I have supposed, the atrophy of legs originated suddenly and to full extent in the type, and was perpetuated by descent, we can understand why it appears on the earliest horizon; otherwise, not. But if it was a malformation from the first, no degree of perpetuation would change its character.

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flies, in the family and sub-family characters, have not changed in 800,000 years, how long time would be required to bring them out of the "common stock" to the grade they had reached in the Eocene? Perhaps the advocates of leg classification can solve it.

Mr. Darwin, in his fourth chapter, gives a diagram explaining his views as to how varieties appeared, and how, from simple variation, genera and families might come to be formed. Starting with several species of a widely distributed genus, which resemble each other in unequal degrees, he represents their offspring by divergent lines—the divergency in each case showing the variation in the descendants of the original species. Many variations appear in one or more of the groups, some of which go but a little way; others flourish, and in their turn give permanent varieties. Some of the original species die out, and, at length, after many thousands of generations, the surviving descendants of the original species are separated into distinct groups of unequal value, and which may be regarded as families and sub-families. The branches, that is, the descendants of the original species, do not evolve one from the other, but are all advancing in their own way, unequally. That kind of evolution is intelligible, at least. One group of butterflies, starting from the "common stock," whatever that may have been, would come to have one manner of pupating, or its bodily organs of a particular pattern; another group a different manner and pattern. The groups are not departing in every respect, or at all equally from the parent form. No matter how far removed in time from the parent, one feature or other may be retained through all the history. Evidently, no such duration of time is required to bring the order of butterflies to their present condition, as is called for by the other scheme treated of. Whether, of the several groups existing at any given period, one were higher in the scale of existence than another, would depend, not on the deformity of a pair of legs, nor the style of pupating, or the papillæ on the tongue, or the presence of a "tibial ephiphysis," but, in the harmonious development of the whole organization. There can be no ascending scale, because one family did not develop out of another, but each separately, and according to the surrounding.* If there is a highest family among the butterflies, as among mammals, the quadrumana,

* There is no evidence whatever that a butterfly sprang from a moth, and it is a fair proposition that all families of the Lepidoptera, diurnal, crepuscular, nocturnal, came from a common parent, and were developing at same time, each in its own way. This calls for vastly less time than the fishing-pole style of evolution.

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birds, the thrushes, it is the Papilionidæ, and the Satyrinæ must go to the bottom, carrying the Nymphalinæ with them.

This matter of relative rank was discussed by Mr. Alfred Russell Wallace, a man who "sees clear and thinks straight," in 1864, with a treatment worthy his high standing as a naturalist, and the argument then advanced has proved unanswerable. It is based on general principles, and no special pleading from diseased legs, or papillæ, or pupæ will touch it. Indeed, the conclusion reached by Mr. Wallace is so manifestly proper that the test of any other theory on the matter must be whether or no it arrives at the same conclusion I am glad to be able to quote the argument, as probably it is new to many of the readers of this magazine: "Butterflies and moths are broadly characterised by their diurnal and nocturnal habits respectively, and the Papilionidæ, with their close allies, the Pieridæ, are the most pre-eminently diurnal of butterflies, most of them lovers of sunshine, and not presenting a single crepuscular species. The great group of the Nymphalidæ, on the other hand, contains an entire sub-family (Brassolidæ), and a number of genera, such as *Thaumantis*, *Xeuxidia*, *Pavonia*, etc., of crepuscular habits, while a large proportion of the Satyridæ and many of the Danaidæ are shade-loving butterflies." He then speaks of certain special characters in the Papilionidæ, the most noticeable of which is the tentacle for self defence, in second segment, which every one of the Papilionidæ is provided with: "Such a structural addition to the organization of the family, subserving an important function, seems to me alone sufficient to warrant us in considering the Papilionidæ as the most highly developed of the whole order." He speaks of the "tibial epiphysis," common to the Papilionidæ and some Hesperidæ, which was supposed by some authors to show a direct affinity between the two groups.* These examples, I think, demonstrate that we cannot settle the rank of a group by a consideration of the degree in which certain characters resemble or differ from those in what is admitted to be a lower group; and they also show that the highest group of a class may be more closely connected to one of the lowest than some other groups which have developed laterally, and diverged farthest from the parent type, but which yet, owing to want of balance, or too great specialization in their structure, have never reached

* Here is another character which could not have passed into the Papilionidæ from the Hesperidæ. Whether the "common stock" had it no man can tell.

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a high grade of organization. The Quadrumana affords a very valuable illustration, because, owing to their undoubted affinity with man, we feel certain that they are really higher than any other order of Mammalia, while at the same time they are more distinctly allied to the lowest groups than many others. The case of the Papilionidæ seems to me so exactly parallel to this, that, while I admit all the proofs of affinity with the undoubtedly lower groups of Hesperidæ and moths, I yet maintain that owing to the complete and even development of every part of their organization, these insects best represent the highest perfection to which the butterfly type has attained, and deserve to be placed at the head in any system of classification."—Nat. Selection. 139 et. seg. It is useless to attempt to disparage the value of the characters cited by Mr. Wallace, as Mr. Scudder does in But. N. E., 74; calling them "utterly insufficient," or to say that they indicate low rank, or have no token of high character about them. To those who also can "see clear and think straight" the argument will be satisfactory.

It accords with reason, that if there is to be, in the future, any advance in the development of the butterflies, it will take place among the sun-loving, many-brooded species of the sub-tropical and tropical regions, where the imagos of the collective broods live fully half a year, rather than among the shade-seeking species, which, according to Mr. Scudder, are mostly one brooded, and numbers of which, as we have seen, live but a few days, with adverse surroundings. It is among the Papilionidæ that variation, and modification and polymorphism run riot, as both Mr. Wallace and Mr. Bates have related. Even in our own limited fauna, we have two species which are dimorphic and polymorphic. But in the eastern Archipelago, every island has a modified form of certain widely distributed species, and several of these species have from two to four different sorts of female. In particular islands the individuals have changed in shape of wing, in neuration and in color. It is out of this family we may expect that species and genera will be evolved.

I, myself, do not consider the Pieridæ as part of the Papilionidæ, having been led to that conclusion by study of eggs, larvæ and pupæ of many species of each family. In these stages the differences are as great as can well be. On page 120, But. N. E., Mr. Scudder says of a paper of mine which appeared in this magazine: "The facts brought forward show that the arrangement of the genera commonly adopted in Europe is

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altogether unnatural, as one would expect to find it, founded solely upon a few characters drawn from the neuration of the wings," adding, "an excellent opportunity for inaugurating a new and more substantial classification is now open to the general student." Instead of genera, say genera and families. In my view, the Pieridæ form a natural family, the Parnassidæ another. After these come the Erycinidæ and Lycænidæ, then the Nymphalidæ, with Satyrinæ next the Hesperidæ. With this arrangement, the "curious resemblances" noticed by Mr. Scudder in all the four stages of the Satyrinæ to the Hesperidæ puzzle no longer; the "phyletic meaning" is intelligible, and we can admire the fitness of things in general.

ERRATUM.—The word "turned," on page 66, line 13 from top, should read "tumid."

NEW SPECIES OF CANADIAN TENTHREDINIDÆ.

BY W. HAGUE HARRINGTON, OTTAWA.

1. NEMATUS OCREATUS.—♀. Testaceous or honey-yellow; length, 0.35 inch.

Head polished, sutures behind ocelli well defined; ocelli in a slightly curved line with the lower one on the rim of a large shallow basin; face below antennæ whitish, especially a triangular spot at their base; mandibles reddish; a dark impressed point above each antenna, another between them, and one on edge of occiput; antennæ slender, two-thirds as long as body, black with basal joints paler; joints three and four subequal; five shorter.

Thorax with sides of prothorax paler; the meso-thorax darker with a black line on the lateral lobes, and a dark spot within at the base of this line; metathorax with tip of scutellum and post-scutellum and the sutures narrowly black; wings large, hyaline, irridescent; nervures blackish; stigma and anterior border pale; legs unicolorous with body; the extreme tip of posterior tibiæ and their tarsi in part, brown or blackish.

Abdomen stout, slightly longer than head and thorax, uniformly honey-yellow, paler below laterally; basal plates margined with black, and with a dusky spot at side; ovipositor sheaths polished, transparent, plainly showing the large ovipositor; cerci long, black at tips. One specimen captured near Hull, Q., on 16th May, 1886.

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2. HARPIPHORUS VARIPICTUS.— ♀. Length 0.35 inch; expanse wings 0.80.

Head and thorax black with white markings; antennæ with terminal joints white; abdomen and legs rufo-testaceous. Head black, with shallow punctures; distinct sutures from base of antennæ to vertex; clypeus truncate; labrum rounded; clypeus, mandibles, palpi, entire orbits and posterior angle, triangular spot at base of antennæ, the tips of two basal joints, sixth in part and seven to nine entirely white.

Thorax polished, black; borders of prothorax, tegulæ, a large spot on flanks, a smaller one over middle coxæ, the scutellum, two short lines on lobes of meso-thorax, the cenchri, the coxæ in larger part, and the trochanters, ivory white; wings hyaline, with a slight yellowish tinge; nervures brown, stigma and costa testaceous; lanceolate cell with straight crossline; hinder wings with one middle cell. Legs, except coxæ and trochanters, rufous; tips of posterior femora, and a dot on tip of tibia behind, blackish; inner spur of anterior tibia strongly bifid; all the claws bifid, rufous.

Abdomen rufo-testaceous above, paler beneath. Captured by Mr. Fletcher, while collecting with me near Hull, 10th June.

This handsome insect is near *varianus* Nort., and *versicolor* Nort., and has also a strong superficial resemblance in size and coloration to *Strongylogaster pallidicornis* Nort. The venation of the anterior wings is peculiar; the lanceolate cell in each has two short straight cross-lines, which form a small cell near its middle.

3. PHYMATOCERA NIGRA.— ♀. Robust, shining black; length 0.20 inch; breadth of wings 0.45 inch.

Head broad, but not so wide as thorax; a brief groove above each antenna and each posterior ocellus; clypeus truncate, labrum edged with white, tips of mandibles rufous; antennæ as long as head and thorax, slender, gradually tapering to tip; joints 3 and 4 sub-equal, 5 slightly shorter, remainder of nearly equal length.

Thorax polished; beneath with very fine short pubescence; wing-scales white; median lobe of meso-thorax short, sutures faint, scutellum sparsely punctate; flat, polished, with two shallow pits at base; wings hyaline; nervures brownish, first recurrent received in middle of second submarginal cell, second recurrent about one-third from base of third submarginal cell, nervure dividing marginals straight; legs whitish, base of

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the anterior and intermediate and most of posterior femora black, tips of tarsi, especially the posterior ones, piceous or blackish.

Abdomen short and stout, with very fine yellowish pubescence, more abundant on terminal segments; ovipositor conspicuous, sheathes black, shining.

Described from five specimens, all ♀, collected in this vicinity. In general appearance it much resembles *Monophadnus medius* Nort., and might be readily mistaken for that species, except for the antennæ. It even more closely resembles a Blenocampa, which I take to be *B. paupera* Prov.

4. MACROPHYA PROPINQUA.—♀. Black, length 0.5 inch; expanse of wings 1.0 inch.

Head broader than thorax; clypeus emarginate, labrum truncate, both white, line on mandibles white, palpi whitish; antennæ slightly swollen in middle, joint 3 nearly as long as 4 and 5; two indistinct white dots on edge of occiput.

Thorax with slender white line on edge of collar and of wing-scales; meso-thorax polished, moderately punctured and slightly pubescent, median lobe sulcate; scutellum convex, more coarsely punctured and pubescent; a line on anterior and middle coxæ and most of their trochanters, a large spot on posterior coxæ, with trochanters entirely, white; a white line on anterior tibiæ before, extending nearly half way on femora; tarsi with all the joints white, tipped with black, except first joint of posterior, which is black, with a small white dot at extremity without; edge of basal plates white; apical half of wings pale fuliginous; abdomen stout, polished.

Described from two ♀ collected in July. This species is closely allied to *M. tibiator* Nort., but differs in having the posterior tibiæ entirely black.

Var. a, ♀.—Two specimens, also collected near Ottawa, differ in having only the sutures of trochanters white, and in having more black on the tarsi and anterior legs, with a dusky spot on clypeus and labrum.

5. TAXONUS RUFIPES.—♂. Black, legs rufous; length 0.35 inch; expanse of wings 0.65 inch.

Head finely punctured, with a fine pubescence, more marked upon the face and basal joints of antennæ; ocelli in a triangle, the lower one at the summit of a bell-shaped shallow depression, the channels at sides

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of ocelli terminating behind in a deep puncture; clypeus short, scarcely emarginate; palpi piceous; antennæ long, stout; joints 3 to 9 sub-equal, terminal joint blunt at apex.

Thorax polished; tegulæ, with a large angulated spot before on prothorax, pale rufous; legs rufous, except base of coxæ and tips of some of the joints of tarsi, which are more or less blackish; wings hyaline, irridescent; nervures and stigma black, a spot in centre of second submarginal cell, lanceolate cell without crossline, two middle cells in posterior wings.

Abdomen long, flattened, sides parallel; segments 2 to 5 of tergum with the apical margin narrowly pale rufous.

Described from two specimens captured in May.

6. TENTHREDO SEMICORNIS.—♂. Black, abdomen and legs partly rufous; length 0.40 inch; expanse of wings 0.85 inch.

Head wider than thorax, excavated in front, with a strong ridge above each antenna; clypeus, labrum and base of mandibles white; antennæ moderately stout and about as long as the abdomen; five basal joints black (the third with a narrow rufous ring at base), four terminal joints white, except the extreme apex of last which is black.

Thorax black, except a white spot on flanks, a larger one above the posterior coxæ, and another on lateral margins of the basal plates; wings hyaline, stigma and nervures blackish; tegulæ and base of costa rufous; legs ferrugineous, anterior pair paler; coxæ and trochanters partly white with base black; a line on femora above, a spot at apex of tibiæ within, and posterior tarsi, except last joint and base of first, black.

Abdomen black at base and apex; segments 3 to 6 rufous, margined with black; ventre rufous except two apical segments.

Described from a single specimen captured in the city on 9th June, 1886, by Mr. J. A. Guignard. This species has the appearance of *rufopediba* Nort., with the antennæ of *grandis* Nort., by which it may be easily recognized.

7. TENTHREDOPSIS EVANSII.—♀. Yellow, with black and green markings; length 0.45 inch; breadth of wings 0.90 inch.

Head yellow, except an oval black spot surrounding the ocelli, within this black patch are two short yellow lines, one on each side of lower ocellus; clypeus squarely emarginate, pubescent, as also labrum which is margined with green; mandible yellow at base, centre green and tip

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black, shading to ferrugineous; palpi greenish; antennæ black, greenish below; eyes bronze.

Thorax yellow, paler below; dorsal surface black; scutellum and post-scutellum, with four short lines before, yellow; wings hyaline, lightly obscured in apical half; nervures almost black, stigma and costa green; legs variegated; coxæ, trochanters and femora yellow, the latter with a small black dot at tip within; tibiæ and tarsi green, with the tip of former and of each joint of latter black; claws red.

Abdomen yellow, with a broad black dorsal band, uniform in width to terminal segment, when it is rounded and does not quite attain tip; ventre inclining to ferrugineous, especially the terminal segments.

Described from a specimen collected at Sudbury, Ont., by Mr. John D. Evans.

I have much pleasure in naming this beautiful insect after its captor, who has made large collections at Sudbury, and added much to our knowledge of the fauna of that part of Ontario.

CORRESPONDENCE.

ARZAMA OBLIQUATA.

Dear Sir: Upon my return from London on the 29th March, there was awaiting me, through the kindness of Mr. Brehme, a parcel containing a piece of Typha stalk nine inches long, full of longitudinal burrows, indicative of larval work. In one of these I found a small sized chrysalid and a larval skin. I put the pupa in my hatching box, and the stalk out of the way for the time. On the morning of the 8th of April, sitting in my room looking vacantly at the window, my attention was aroused by observing the outline of a moth at rest on the upright centre sash. Upon close inspection it proved to be a large sized *Arzama obliquata*, in perfect condition. Had Mr. Brehme's chrysalid hatched and the moth escaped from the box? But it seemed quite too large to have come from it. I then looked in the box, and there, resting at the top, was a small sized moth, and the empty pupa case lying on the bottom. I then got the stalk and began a careful investigation, and in the very centre I found a large cavity with a quantity of fine cuttings at the bottom, the empty pupa case of my large moth, and the cast off larval skin. A natural pair at the same time.

Hamilton, April 10th, 1889. J. Alston Moffat.

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BOOK NOTICE.

INSECTS INJURIOUS TO FRUITS, by William Saunders. Second editon. Philadelphia: J. B. Lippincott Company. 1 vol., 8 vo., pp. 436.

It is with great pleasure that we announce the publication of the second edition of this valuable and important work. That a new issue should be called for is a most satisfactory proof of the excellence and permanent usefulness of the book, and establishes the fact that Prof. Saunders has provided the fruit growers of North America with a standard manual upon the insect enemies they have to contend with. Six years have gone by since the issue of the first edition, and, during that time, great and steadily increasing attention has been given to the study of economic entomology, with the result that many new methods have been discovered for successfully combatting the ravages of noxious insects. The most important and useful of these the author has now embodied in his book, and has done so with very little change in the text of the work. A superficial reader would hardly notice the alterations, but we find that many have been made, and that they bring down the information given to the knowledge of the present day. As an example, we may mention the insertion among the remedies for the codling worm, of the apple and the plum curculio, the recently discovered method of spraying with a mixture of Paris green and water, which has proved so eminently successful. For the information of those of our readers who are not already familiar with the work, we may mention that the insects treated of are grouped under the name of the particular fruit that they attack, and are arranged in order according as they affect the root, trunk, branches, leaves and fruit. An illustrated life history is given of each, followed by an account of the most useful remedies that may be employed, and of any parasitic insects that assist in keeping the pest in check. Twenty of the most important fruits are dealt with, and two hundred and sixty-six noxious insects and a large number of beneficial ones are more or less fully described. The book is beautifully printed on fine paper, and illustrated with four hundred and forty admirable wood cuts. While this work is simply indispensable to the intelligent horticulturist, it is also of great value to the practical entomologist, and a most useful book to place in the hands of beginners. The young collector will find in its pages figures and descriptions of most of the insects that he meets with, and the more advanced student cannot fail to learn from it much that would otherwise escape his observation.

Mailed May 7th.

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The Canadian Entomologist.

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CORRECTIONS AND ADDITIONS TO PREVIOUS PAPERS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

The lapse of time and further observation on some of the things treated of in papers previously published in the ENTOMOLOGIST, render it desirable to make some corrections and additions.

Trogoderma ornata, Vol. XV., 91, and XVI., 37.—The treatment of this pest there detailed so completely annihilated it that it has not been seen since.

Dermestes Frischii, Vol. XVI., 37.—Seems to be successfully naturalized, since it still occurs abundantly on Brigantine Beach, and last September was found at Atlantic City. Mr. Ulke has also taken it at Washington, D. C. (Ulke MS.).

D. murinus, *l. c.*—This species, if ever imported, is not known to have established itself. There is a form of *D. nubilus* Say, with black or partly black antennæ, and a minimum of fulvous mottling on the thorax; specimens of this kind were probably before Dr. Leconte when he described his *murinus*, Pr. Acad. Nat. Sci. VII, 108; and before Dr. Jayne when writing his "Revision of the Dermestidæ."

Blaps.—The Virginia species of *Blaps*, found very abundantly at Alexandria, is *similis* Latr., as stated by Professor Riley. Another species found in Maryland by Mr. O. Lugger, is *mucronata* Latr. The comparisons and determinations were made by Dr. Horn on his recent trip to Europe.

Ceratocampa regalis, Vol. XVI., 15, 47 and 132.—I have had several favourable opportunities to observe the mode of pupation of the gigantic larvæ of this regal moth. Where it can find ground soft enough to penetrate, it always pupates under the earth, and if at a proper depth the pupa remains there in a clay cell formed around it by its own motions till it discloses in May; but if the larva does not get deep enough the pupa works to the surface and probably does not survive. Should the larva, as is

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frequently the case, find no ground soft enough to bore into, it pupates wherever it may be when the change can no longer be deferred, and this occurs mostly under some leaves. Some of these exposed pupæ when collected in April will produce moths, notwithstanding the low temperature to which they must have been subjected.

Pterostichus, Vol. XVI., 73.—I there enumerated sixteen species taken in this vicinity; four others have since been discovered, and three have been transferred from *Evarthrus*, making a total of twenty-three.

P. vinctus Lec.—This species is semi-mountainous, inhabiting under stones on the sides of steep hills where the soil is moist and friable. Though not gregarious, when found several individuals may be taken in the same vicinity. Near the city, it must soon become extinct.

P. unicolor Say.—Of this rare insect I have only taken one specimen, and Mr. W. Klages took another. It must be sought for in mountainous places.

P. lachrymosus Newm.—Occurs with *adoxus*, and in about equal numbers; without care, from their great resemblance, they may easily be confused. Their future must be the same.

P. coracinus Newm.—On the south side of the Ohio, on the rugged sides of the hills yet in a primitive state, this species occurs abundantly. Certain individuals may readily be confused, some with *stygicus* and others with *relictus*, according to the greater or less development of certain characters at the base of the thorax. It is not likely to soon become extinct.

P. tartaricus Say, for form *strenuus* Lec.—Specimens were taken in the city, in June and July, at electric lights, but it did not occur to me elsewhere.

P. patruelis Dej.—This little species inhabits a small swamp, inaccessible, except for a short time during the dry season. It is found about the roots of bunches of grass. When this swamp shall have been drained, this species will probably be extinct here, since no other primitive swamp remains in this vicinity.

P. femoralis Kirby.—Three specimens of this small species were taken once, but the habitat was not observed, though probably it is the swamp mentioned above.

P. Hamiltoni is much more widely distributed than was at first known. It occurs at a distance from the city on the sides of many of the hills in

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their primitive state, and I have seen specimens from Maryland, West Virginia and Eastern Ohio.

Atænius, Vol. XVI., 189.—The species mentioned as undescribed has since been described by Dr. Horn under the name *Wenzeli*.

Epitragus arundinis, *ib.*, 190, is found abundantly in August and September, feeding on the pollen of the beech grass growing on the sandy dunes, the underground stems of which probably sustain the larvæ.

Lixus concavus, Vol. XVII., 38.—It is quite possible the bottle of cyanide of potassium, in which this beetle was placed for several days, may have contained no free hydro-cyanic acid, as the cork was airtight; therefore this proof of the longevity of the beetle is invalid.

Ips fasciatus, *ib.*, 46.—Lately the melanotic forms have occurred here in midsummer about as frequently as the fasciated. The difference in color does not appear to be either seasonal or racial. If a locality exists where either form is alone found it is unknown to me. If *melanism* depends on cold, a latitude or altitude should be reached where there would be only dark forms, and *vice versa*. The color of such of the European forms of *Ips* as I have seen appears to be more constant than in ours. The markings on *I. 4-guttatus* Linn., which appears to be the same as our *fasciatus*, only with a perceptibly finer punctation, are very uniform in the numerous specimens I have seen, consisting of a humeral spot, trilobate in form, and two roundish ones behind the middle of the elytra, either separate or united like dumb-bells, yellowish or reddish. The suggestion of Mr. T. D. A. Cockerell, of Colorado, that humidity may be a potent factor in determining the color in variable species, seems deserving of consideration.

Macrobasis unicolor, *ib.*, 48.—A nursery of young locusts *(Robinia pseud-acaciæ)*, growing on a stony knoll surrounded by meadows, was almost defoliated last July by swarms of this beetle. This knoll had probably been used the previous season by the grasshoppers *(Locustidæ)* of the meadows as the grand depository for their eggs, which were undoubtedly the food of the larvæ of these beetles; and which, after disclosure, promptly, in their voracity, attacked the nearest *Leguminosa*. This species is usually classed in economic entomology as *noxious*, because it occasionally eats a few beans, etc.; but it is certainly entitled to rank among the first on the list of *beneficial*, as without its friendly aid it is greatly to be feared the grasshopper would quickly become so numerous as to seriously affect agriculture.

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Piazorhinus pictus, ib., 105.—This variable species is fairly abundant here, and is beaten from various bushes, especially oak. In Florida it seems common.

Cicindela, ib., 201.—On Brigantine Beach, N. J., *C. lepida* is sometimes found with *C. hirticollis*. When at rest it is not readily seen on the white sand—its own colour—and rarely moves till in danger of being trampled on, seemingly aware of the protective colour of the sand. A collector has stated to me that where it occurs on dark ground it is exceedingly wary and difficult to capture. With the species of the main land mentioned, occur in abundance, *C. consentanea*, *purpurea* and *punctulata*.

Danais archippus, ib., 204—Very few individuals were seen on Brigantine in 1887 and 1888, and no larvæ of *Anth. polyphemus*, nor of *H. io* were found, though quite abundant other years.

Clœotus aphodioides, Vol. XIX., 64.—This species has been the subject of renewed observation, and the former statement of its mode of hibernation must be re-affirmed. Mr. O. Lugger (Proc. Ent. Soc., Washington, V. I., 84) sheds light on its early stages, stating that he has frequently bred these beetles from their eggs, and has found them in all stages, *in situ*, viz., under the bark of dead trees, where they found food in the decaying material: adding, that very likely the specimens found by myself did not enter the holes to hibernate, but rather had made them to leave the place of their birth. The statement of Mr. Lugger is very interesting as to the habits of the larvæ, and it is to be hoped he may make known in greater detail the form of the eggs, larvæ and pupæ, as it is, so far as I know, the only species of the *Scarab. Laparosticti* that is recorded as being lignivorous in the larval state. With decaying wood as the breeding place of the larva, any discrepancy of observation about hibernation may be readily reconciled. Mr. Lugger's timber, under the bark, was probably rotten, and there the larvæ fed, pupated, disclosed, and the beetles hibernated. My timber, under the bark, was sound, and the bark inseparable from the wood, and there was no rotten wood for the larvæ to feed on; but the base of the tree and the subterranean roots would supply this material amply. The beetles, however, could not hibernate there, and so crawled up the tree and into any available hole; this also accounts for the mud on the elytra of many.

Saperda Fayi, Vol. XX., 6.—I have further to state that some of the

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larva do not return in the spring of the second year to feed on the dead wood at the entrance of their burrows, but bore on directly up or down the centre of the limb, attaining a distance of from sixteen to twenty-four inches before pupating, in which case the beetle escapes by a round hole.

S. concolor, Vol. XX., 8.—Some of the larvæ of this species, like in *S. Fayi*, bore in the centre of the limb some distance, the beetle escaping by a round hole, which, I think, is cut by itself, as one from which a beetle was crawling appeared to have been newly made.

Dicerca prolongata, Vol. XX., 65.—The statement that this species breeds in conifers, while probably correct, requires more confirmation. It has, however, been ascertained that it breeds in some species of the *Salicaceæ*. Mr. Blanchard records its occurrence in Massachusetts, in June, on the trunks of young poplars and on poplar logs *(Populus tremuloides)*. Mr. F. Bowditch took it on the same tree in the Rocky Mountains, and also on a species of willow *(Salix)*; while in the mountains of Colorado, Mr. T. D. A. Cockerell took the beetle and probably its larvæ from this same poplar, when splitting it for firewood (Ent. Month. Mag., XXIV., 232).

Myrmophilous Coleoptera, Vol. XX., 161.—The following species must be added to the list:—

Biotus formicarius (Casey, Bull. Cal. Acad. Sci., II., 8).—Occurred at Los Angeles, California. "This interesting species lives in the nests of a small, pale brown ant."—Casey. *Biotus* is a new genus in CTENISTIDES. A figure of the insect accompanies the description.

Ptenidium evanescens Marsh.—This species, according to Matthews, is common in America, Europe, the Canary Islands and Madeira. F. W. Maeklin in his COLEOPT. MYRMECOPHILA FENNICA (No. 102), states that it is often taken, both mature and immature, in the nests of *Formica rufa*, as well as in other situations.

Limulodes paradoxus Matth.—This curious insect is described and figured in Ann. Lyc. Nat. Hist., N. Y., VIII., 409. It was first taken by Dr. Brendell in Florida, and subsequently by Mr. Ulke in New York and the District of Columbia, frequently in the nests of a yellow ant, which Dr. Leconte thought identical with the species with which *Ceophilus monilis* lives. My specimens are from Massachusetts.—Blanchard. Probably not rare. Trichopterygia (Matthews), 157.

Trichopteryx fascicularis Hbst.—Inhabits Europe and North Ameri-

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ca, occurring sometimes with ants, but usually in the rejectamenta of stables, and seldom or never in rotten leaves, *l. c.*, 134. This species is a doubtful myrmophile.

Emphylus Americanus Lec. (Bul. U. S. Geol. Surv, Vol. V., No. 3, 513).—Mr. Schwarz took the type of the species in an ant's nest at Veta Pass, Col., at the altitude of 11,500 feet.

Soronia (Amphotis) Ulkei Lec.—Mr. Ulke says of this species :—" I have found it every year, early in spring, in the nests of a small black ant (*Cremastogaster lineolata* Say), and this year I collected them in numbers among *Formica rufa*. The only species in Europe—*Amphotis marginata* Fab., is said to be found on flowers. Erichson found them, however, abundantly in the nests of *Formica fuliginosa*."—Entoml. Amer., III., 78.

Hypocoprus formicetorum Mots. (Bull. Mose., 1840).—This species, described from the Kirghis Steppes in Asia, was taken by Mr. Schwarz at Fort Garland, Colorado, in an ant's nest.—*l. cit.*, 503; Class. of the Coleop. of N. Amer., 140.

Myrmechixenis latridioides Crotch. Occurs from Washington southwards, having been introduced with green-house plants.—Class., 140, Trans. Am. Ent. Soc., IV., 363. The habits of this species have not been recorded; but, as the European species live in ants' nests and about green-houses, it is introduced here to direct attention to it as a probable myrmophile.

Euparia castanea Serv. Occurs in Florida, Alabama and Louisiana, in the nests of a small ant (Horn).—Tr., XIV., 87. To be commonly met with in the Southern States in the nests of *Solenopis Xylini* McC., the stinging ant of the cotton fields.—Amer. Nat., XVI., 784.

Euphoria hirtipes Horn.—This species is stated to have been found in Nebraska by Mr. Lawrence Bruner in the hills of the common red ant. It occurred quite commonly, and the larvæ were found as well as the beetles.—Amer. Nat., XVI., 748. The discovery of the larvæ of this beetle is a matter of so great interest, that the absence of all further account of them is disappointing. Maeklin states that the larvæ of *Cetonia aurata*, a near ally, are so abundant in the nests of *Formica rufa* on sandy shores, that fishermen use them commonly to bait their hooks.

Cremastochilus Knochii Lec.—This species was taken in the spring in ants' nests in Colorado by T. D. A. Cockerell, Custer County (in letter).

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Hymenorus rufipes Lec.—The larvæ of this beetle were found abundantly in the nests of *Formica fusca* by Messrs. Pergande and Schwarz near Washington, D. C., and the beetles bred therefrom.—Am. Nat, XVI., 748, and XVII, 1176.

H. obscurus Say.—The larvæ of this beetle were likewise found at the same place in the nests of a large yellow ant, and, from the great care bestowed on them by the ants, it was inferred they were not there by accident.—*Ib.*, XVI., 748.

Mr. F. W. Maeklin published in 1846 his COLEOPTERA MYRMECOPHILA FENNICA, enumerating 136 species. He included such as were known to live with ants habitually; such as were found with them occasionally, but usually elsewhere, and even such as occurred in the vicinity of their nests, if of unknown habits. But the scope of the present catalogue is more limited, as stated in the introduction, and would exclude a large number of those on his list, and among them probably all of the following European-American species:—

Bembidium 4-maculatum Linn.—Dr. Sahlberg took at Ylæne a single individual with *F. rufa*. This species requires no further notice.

Tachyporus brunneus Fab —Occurred once at Urpala in the society of *F. fuliginosa*. This species is exceedingly abundant here in early spring under stones and chips; sometimes an ant's nest is found under the same stone with the beetle, but I never discovered any connection between them, except the stone.

T. scitulus Er.—Taken not rarely in the nests of *F. rufa*. I only know this species at secondhand, having obtained it from Mr. Dury, of Cincinnati. Its habits in this country have not been noted.

Tachinus pallipes Grav.—Occurred once at Urpala among *F. fuliginosa*. *Pallipes* is very common here, and is simply a scavenger beetle.

Conosoma pubescens Payk.—Found occasionally in the nests of *F. rufa*. This species is abundant here under the bark about the base of dead trees and stumps; as ants also frequently make their nests in the same place, their being often found together is to be expected, but this does not make the species a myrmophile.

Ptenidium evanescens Marsh.—This species I include in my list doubtfully.

Meligethes æneus Fab. (*Brassicæ* Scop.).—Found rarely at Kavantholm in the nests of *F. rufa* by Mannerheim. In our country this species

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occurs on the Pacific slope and in the Rocky Mountains, and I am unwilling to admit it in my list without further proof.

Cyphon padi Linn.—Taken rarely in the nests of *F. rufa* at Kavantholm, Kirjola and Urpala. It is not known as a myrmophile in this country.

Otiorhynchus maurus Gyll.—Maeklin occasionally took this species in the nests of *F. rufa* at Kirjola. In America this species is known to occur only in Greenland, and its habits are entirely unknown.

Leptura, Vol. XXI., 32.—While this article was in press, Dr. Geo. H. Horn published in the Tr. Am. Ent. Soc. a new arrangement of the *Leptura* therein named, based on an examination and study of the types in the British Museum. The form I mentioned as being undescribed turned out to be really *nana*, and now *hæmatites* is regarded as its varietal synonym. The typical *nana* is thus described :—"Antennæ always piceous; anterior femora and base of middle yellowish, many specimens, however, occur with brown legs, and others with parts of the hind legs yellowish." Except these two the other forms remain as before.

Erratum—Page 33, line 18, read female, instead of male.

ADDITIONS TO THE LIST OF CANADIAN COLEOPTERA.

BY ALVA H. KILMAN, RIDGEWAY, ONT.

By frequent trips to the woods and marshes in spring, to gather and sift the moss for hibernating coleoptera, by minutely examining the debris on the shore of Lake Erie, and by the use of umbrella and sweeping net later in the season, I have added to my collection of beetles, since 1886, several hundred good species. The following list contains those of my captures that do not appear in the lists of Canadian Coleoptera.

The species marked with an * are recorded by W. Hague Harrington in his additions to Canadian Coleoptera, published in Vol. XVI., page 44 of this journal. Those distinguished by two ** are named in Prof. J. T. Bell's list of Staphylinidæ, taken at Belleville, vide Vol. XVII., page 49 of this Journal. All the others, as far as I can learn, are quite new to Canada. For convenience of reference, I attach the numbers found in Henshaw's List of North American Coleoptera.

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To Mr. Henry Ulke, of Washington, I am indebted for correct determinations. Dr. John Hamilton, of Allegheny, also kindly assisted me.

Upon such authority, it will be safe to credit the insect fauna of Canada as follows :

155—*Elaphrus fuliginosus* Say. Rare, with *Elaphrus Clairvillei* Kirby, hibernating under moss in low woods. March to May.

269—**Clivina Americana* Dej. On lake shore.

285—*Schizogenius ferrugineus* Putz. Very rare ; one specimen in the sand on lake shore.

300—*Nomius pygmæus* Dej. Muskoka. August.

372—*Bembidium arcuatum* Lec. Rare in moss.

580—*Pterostichus Pennsylvanicus* Lec. Found hibernating in the clay of moss-covered banks in low woods ; not rare. April.

741—*Badister reflexus* Lec. Not common in moss.

784—*Platynus pusillus* Lec. Rare ; found two specimens on a decayed log. May.

792—**Platynus propinquus* G. & H. Rare ; hibernates in decayed wood.

1150—*Acupalpus carus* Lec.

1165—*Tachycellus Kirbyi* Horn. Common in moss.

1186—*Anisodactylus interpunctatus* Kirby.

1262—*Desmopachria convexa* Aubé. Not common.

1434—*Agabus subfuscatus* Sharp. Rare in clear water.

1818—*Scydmænus mariæ* Lec.

1920—*Bryaxis dentata* Say.

2096—***Heterothops fumigatus* Lec.

2102—*Quedius peregrinus* Grav.

2199—*Philonthus æqualis* Horn. Common.

2221—*Philonthus nigritulus.* Quite common.

2236—*Actobius nanus* Horn.

2237—*Actobius inutilis* Horn.

2243—*Actobius sobrinus* Er.

These species of *Actobius* are found in moss on the ground in wet places of the low woods. April and May.

2337—*Stenus indigens* Casey.

2364—*Stenus pusio* Casey.

2377—*Stenus mammops* Casey.

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2384—*Stenus egenus* Er.
2391—*Stenus canaliculatus* Gyll
2398—*Stenus parallelus* Casey.
2463—*Stenus punctatus* Er.

The *Steni* are to be found in sphagnum and other mosses at any time of the year, but especially in early spring. The same may be said of nearly all the Staphylinidæ here named.

2527—***Lathrobium tenue* Lec.
2530—***Lathrobium debile* Lec.
2548—*Scopæus dentiger* Lec.
2562—***Lithocharis obsoleta* Nordm.
2675—***Mycetoporus flavicollis* Lec.
2724—*Bledius nitidicollis* Lec.
2757—*Oxytelus nitidulus* Grav.
2948—*Trichopteryx sericans* Heer.
2978—*Bœocera concolor* Fab.
2983—*Scaphisoma suturale* Lec.
3017—*Sacium lunatum* Lec. Found on dead twigs of apple. June.
3234—*Tritoma festiva* Lac. Three specimens on decaying beech tree. June.
3235—*Tritoma macra* Lec. Rare; beaten from decaying tree trunk.
3244—*Synchita laticollis* Lec. One specimen from dead wood.
3326—**Læmophlæus convexulus* Lec. Two on dead apple twigs.

(To be continued.)

CATCHING BUTTERFLIES BY MEANS OF DECOYS.

BY SHELLEY W. DENTON, WELLESLEY, MASS.

It has long been a matter of fact to me, and one which has served a good purpose, and doubtless to other readers of the CAN. ENT., that many butterflies, especially the larger kinds, are attracted by decoys resembling themselves in size and colour.

So many incidents of this nature have crowded themselves upon my notice, that I trust it will not be considered presuming on my part to enumerate a few of them, and at the same time state the benefits to the butterfly hunter which may arise from this source.

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My attention was first called to this fact some fifteen years ago, while collecting in the neighborhood of Boston. I caught one day an example of *Papilio turnus*. After taking the insect from my net, and while holding it in my fingers, preparatory to placing in my collecting box, another butterfly of the same kind darted down at the one I held and fluttered above it for a moment, as if to entice it away. I was so surprised that no attempt was made to capture the visitor until he had risen beyond reach. Expanding and placing on a bush close by, the almost lifeless butterfly which I had held in my fingers, and partially concealing myself, I awaited the insect's return; nor was I disappointed or obliged to wait long. I could catch an occasional glimpse through the bushes of my intended victim: nearer it came, till hovering for a moment above my decoy, was easily secured. This plan was followed during the rest of that day, and more or less since that time, with gratifying results; having caught as many as thirty-seven *Papilio turnus* in a day, and that, too, in a place like Eastern Massachusetts, where they are, so far as my experience goes, not very common.

While in Nevada, in the summer of 1887, this method was followed with good success in the capture of *Papilio rutulus*, *eurymedon*, and *daunus*; *Argynnis leto*, *nevadensis*, and *coronis*; *Limenitis lorquini*, and others. I found a piece of bright yellow paper, cut out to resemble *P. rutulus*, proved almost as attractive as a butterfly of that species, and even a yellow leaf, which I picked up and placed in a conspicuous spot, answered the purpose very well once, to enable me to secure a decoy.

I find the best place to expose a decoy is in some sunny nook, where an occasional specimen of the species of which you are in search is seen, allowing the full rays of the sun (provided your decoy is a butterfly) to strike on the expanded wings. It is usually my custom to cut down the green bushes, except, perhaps, one in the centre of the opening, and stripping the leaves from the tallest sprig or branch, place my decoy on the point. The decoy may be a badly damaged specimen—one not fit to preserve.

This method applies best to the larger and stronger flying species of butterflies, and these are the ones the hunter has the greatest difficulty in procuring, especially if the country is rough and broken, so he is restricted in his movements by deep gullies, cliffs, or large, loose rocks. Occasionally the hunter will have an enemy in the shape of a large dragon

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fly, which will pounce on the coming prize just as you are about to "scoop" it in; then away the two will go. The butterfly soaring and flapping often till almost out of sight, in the vain endeavour to rid itself of the enemy which has taken such a death-like grip upon it, but this shark of the air is in the end generally victorious.

In some countries, such as Australia and New Guinea—and I speak of these because of personal knowledge—there are large and showy butterflies of very powerful flight, which are almost impossible to catch on the wing, not only being shy, but high-fliers; and I know of no way in which they can be taken so readily as by the method above described. I refer particularly just now to that large and magnificent blue butterfly (*Papilio Joësa*) which in Northern Queensland may be seen alighting on or floating above the tops of the forest trees, occasionally flashing in the sunlight like a star of unusual brilliancy. It is a magnificent sight to a butterfly hunter, and one that will fill him with enthusiasm, but one likely to be of great disappointment should he wait for it to come within reach or settle near the ground, where it could be taken with his net; for nine times out of ten, when it takes flight, it will sail around and away over the tops of the trees till lost from view, unless you have something to catch its eye and cause it to descend from its elevated position. Now, procure one of the same species and place it in a conspicuous place in the sunlight; conceal yourself near by, but be ready to strike at a moment's notice, and await the result. Your decoy will most likely soon be seen (for it is wonderful how quickly a butterfly will discern one of its own kind), and down will come the longed-for prize, to your delight and satisfaction; but you must sweep with your net at just the right time, or the opportunity is lost. But perhaps you ask how is the first specimen or decoy to be obtained? This is often a matter of considerable difficulty. I was accustomed when rambling in the forests of that country to carry a gun, and although when obtained by shooting they were generally in a rather dilapidated condition, yet they served the purpose of a decoy very well.

One thing which has always surprised me, is the remarkable sight and, perhaps, sense of smell which some insects seem to possess. Often while having a decoy exposed, I have been startled by the sudden appearance of a butterfly when none were apparently in the neighborhood. The causes which lead to the attractiveness of decoys no doubt are various. Possibly the passing butterfly on seeing the decoy, supposes the latter

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has found an abundance of suitable food. But my opinion is, that in the majority of cases it is a matter of sexual importance, and but for this powerful influence which causes them to seek each other, and thereby propagate their species, these most beautiful objects of nature would eventually die out.

NOTES ON THE PREPARATORY STAGES OF CARTEROCEPHALUS MANDAN.

BY JAMES FLETCHER, OTTAWA.

Amongst some fertile eggs of butterflies obtained during the past summer by gently pressing the abdomen of ripe females, was one of the above species, the larva of which was carried through four moults up to hibernation. The information gathered is incomplete; but as there is nothing published concerning the preparatory stages of *C. Mandan*, it seems worth recording, if only to assist others who may be fortunate enough to secure eggs of this rare butterfly. Although widely distributed over North America, I know of no locality where it is abundant. Females taken at Nepigon in the Lake Superior district laid eggs in confinement upon common lawn grass *(Poa pratensis)*.

The following description is drawn from one specimen only for the last two stages, but from three for the first three stages :—

Egg.—Pale greenish-white, hemispherical, broader than high, apparently smooth, but when magnified found to be very faintly and vertically grooved or wrinkled, and densely and uniformly pitted with deep pores which are wide at the mouth and taper to a fine point. Eggs laid 13th July, hatched 23rd.

Larva.—At birth. Length 2.5 mm. Breadth of head, .45 mm.; of body, .35 mm. Length of bristles, .05 mm. Yellowish white, with head and thoracic shield black. Head large and smooth. Body slender, equal. Thoracic shield narrow and bearing a few slender hairs. Body bearing on each side four series of trumpet-shaped bristles. Duration of first stage five days.

From the very first these larvæ were great wanderers, frequently leaving their food plant and crawling all over the glass lamp chimney which was used as a cage. In these wanderings they spun silken paths wherever they went, and to prevent their escape a plug of cotton wadding was

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kept in the top of the chimney. This habit of wandering was kept up through all the stages, and the inside of the glass was covered with their silken paths. At no time, however, did they construct a tent by catching several leaves together in the manner of the larvae of *P. Mystic*, *P. Cernes* and *P. Manitoba*. Directly after they hatched, the young larvæ climbed up to the tops of the blades of grass and made a sort of tent by catching the opposite edges together with two or three cords of silk, about half-an-inch below the tip. They then attacked the edges of the leaf, eating down each side and leaving the midrib. When at rest, during the first three stages, they retired beneath their tents and lay extended along the midrib. After the third moult they would sometimes roll the leaf of a wide species of grass, as *Panicum crus-galli*, into a tube similar to those made by *P. Hobomok*. After the fourth moult no tent was made, the larvæ lying exposed on the upper surface of the leaves when at rest.

After First Moult.—Length, 3.5 mm. Head white and furrowed at apex. Thoracic shield black, much smaller than in first stage. Body pale green with two narrow white lines on each side—one sub-dorsal, the other supra-lateral. Spiracles yellowish. Whole body covered with a minute pubescence. Duration of this stage five days.

After Second Moult.—Length, 6.5 mm. Head rather higher than broad, slightly broadest at the base, rounded at apex, and bilobed by reason of a deep frontal groove; mandibles and two clouds on the cheeks, fuscous. Thoracic shield, transparent and hardly discernible. Body pale green and translucent, the dorsal vessel and the ramifications of the tracheæ showing plainly through the transparent skin. There are, on each side, a pale sub-dorsal band with irregular edges, a distinct clear white supra-lateral stripe, and a very faint supra-stigmatal line. The sub-dorsal bands unite on the anterior fold in the anal segment. The supra-lateral stripes at the end of the anal flap. Duration of stage seven days.

After Third Moult.—Length, half an inch. Head lighter in colour, without the fuscous marks on the cheeks. Of the same size as the cylindrical body. Colour more glaucous green than in previous stages. Duration fifteen days.

After Fourth Moult.—Length six-eighths of an inch. Head greenish, tinged with yellow, a little larger than second and last segments, but smaller than the rest of the body. Head squared at the base, rounded at the apex, and deeply grooved down the front. Width at the base and the

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height about equal. Surface minutely roughened. Ocelli black, arranged in a semi-circle following the contour of the face, four in front and two on lower side. The third and fourth are twice the size of the others. Mandibles white with black tips. Thoracic shield not distinguishable. Body glaucous green with a pale sub-dorsal band, clearly defined with white above, much paler below, leaving a distinct green dorsal stripe. Supra-lateral stripe conspicuous, creamy white and clearly defined; not so wide as the pale sub-dorsal band. Below this, and half way to the spiracles, is a very pale thread-like supra-stigmatal line. Spiracles white, very inconspicuous on a thread-like line, or perhaps this may only be the tracheæ showing through the skin. On segments three and four (counting the head as No. 1) there appear to be beneath the transparent skin, instead of spiracles, knots of tracheæ. Whole body, including the head, minutely shagreened and covered with small piliferous papillæ, which, on segments two, three and four, are black at the base of the hairs. The segmental folds of the body of the mature larva are as follows:— Segment two, transversely grooved; segment 3, three equal folds; segment 4, four small folds; segments 5 to 11 consist of five folds, the anterior twice the width of the second, which, again, is twice the width of each of the other three; segment 12, three equal folds; segment 13, two small folds and the anal flap.

Some interesting epidermal organs, first observed upon this species, but since found on the larvæ of other Pamphilidæ, as well as on the pupa of *P. Cernes*, (the only pupa I have examined) are some small round chitinous disks, which appear to be trichomes or modified hairs. I form this conclusion from finding that, in one species, there occurred in two instances, instead of these disks, piliferous tubercles; they are rather small and difficult to examine. In the larva of *C. Mandan*, they appear to be saucer-shaped, having a raised edge. In the larva of a species of Pamphila, near to *Manitoba*, they are, in some instances, simple annuli; but, in *P. Cernes* and *P. Mystic*, seem to be rather cone-shaped.

Upon the larva of *C. Mandan*, they are arranged in three lateral series, two of which are complete and occur on all the segments except the head, and the other ventral and incomplete, occurring only on segments five, six and eleven.

The first series is placed above, and anterior to the spiracles, and the disks are sometimes double upon the abdominal segments; but they are not always uniform on the opposite sides of the body. In the specimen

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most carefully examined, they were double on segments eight, nine, ten and twelve upon one side, but only on eight and nine on the other, and on segment five there was no disk of this series on one side, but it was present on the other. On segments two, three and four, they are on supra-stigmatal line. On segments five to twelve, below supra-stigmatal line. On segment thirteen on supra-lateral stripe, larger than the others.

The second series is single throughout, posterior to the spiracles, except on segments two, three and four, where they are slightly anterior on the fold above the thoracic feet. The third, ventral, series occurs only on segments five, six and eleven, just beneath the stigmatal fold.

The shape of the larva when mature was different from that of the first stages, the body being largest in the middle and tapering off to each end. The full-grown larva measured one inch and one-eighth on September 12 (twelve days after the last moult). After this, it fed sparingly for about two weeks, and then spun a mat of silk on the face of a blade of grass and drew two other blades over it with single strands of silk. The furrow down the face deepened and appeared to open a little, and I felt sure pupation was going to take place. This, however, was not the case, and two days later the larva left the grass and spun another mat on the sloping side of the lamp chimney. It now ceased to eat, and the colour changed gradually, all the green fading out, and in ten days the body was of a yellowish cream colour with white stripes. This again darkened until the ground colour was a very pale brown or dove colour. The moisture which condensed on the side of the glass kept the lower part of the larva's body constantly wet; but I did not like to risk removing it, as I looked for pupation at any day. After remaining still, and evidently, in hibernation for about five weeks, I found it had fallen from its mat to the ground on 29th October. After about a fortnight discoloured spots began to appear, and I found it was dead. It was at once put into alcohol for preservation and examination.

These larvæ fed freely on all grasses offered to them, but seemed to prefer wide-leaved species; this, however, may have been an instinctive preference for protection, both from the shape of their bodies and the coloration, added to a habit of lying extended down the midrib with the body closely appressed, the lower part of the head protruded, and the apex drawn back, these larvæ are well hidden from observation. The favourite grasses were *Panicum crusgalli*, *P. sanguinale* and *Triticum repens*.

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POPULAR AND ECONOMIC ENTOMOLOGY—No. 3.

CUT-WORMS.

BY JAMES FLETCHER, OTTAWA.

Of all the injuries committed year after year upon field and garden crops, none are more annoying than those due to the ravages of the various caterpillars known as Cut-worms. These are the larvæ of dull-coloured, active moths, belonging for the most part to the three genera, *Agrotis*, *Hadena*, and *Mamestra*, and in North America alone constitute an army of no less than 340 different described species, many of which are, at times, very abundant. They may be described, in a general way, as smooth, almost naked, greasy-looking caterpillars, of some dull shade of colour similar to the ground in which they hide during the day. The head is smooth and shining, and sometimes of a different colour from the rest of the body. On the segment next to the head is a smooth plate, known as the thoracic shield, and there are three or four series of bristle-bearing tubercles along the sides. Their habits are nocturnal, that is, they feed at night and lie hid during the day-time. The habits of most cut-worms are as follows:—The eggs are laid in spring, summer, or autumn, and the insects pass the winter either in the perfect moth state, as a half-grown caterpillar, or as a chrysalis. Those which hibernate as moths, lay eggs in the spring and moths are produced in the autumn. The eggs which are laid in summer and autumn hatch soon after, and the caterpillars either become full fed the same season and pass the winter underground in the chrysalis state, or, after feeding for a short time, become torpid, and so pass the winter beneath stones, heaps of dead vegetation, or in cells beneath the surface of the ground. The injury done by the young caterpillars in the summer and autumn is seldom noticed at those seasons, on account of the abundant vegetation; but, in the spring, not only are the caterpillars larger and capable of more mischief, but the land is cleared of all vegetation other than the crop which is to be grown. They are then particularly troublesome in gardens, cutting off young cabbages, tomatoes, and other plants as soon as they are pricked out. When full fed, these caterpillars burrow into the ground to a depth of some inches and turn to brown chrysalids inside a smooth cell or a light

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cocoon, Fig. 3. From these, after a few weeks, the perfect moths emerge. They are very active at night, and, when disturbed, have a habit of dropping to the ground and remaining perfectly still as if dead, where, from their dull colours, they are difficult to detect. When at rest, their wings lie horizontally over their backs, and the upper ones entirely cover the lower pair. The upper wings are generally crossed with one or more waved lines, and always bear two characteristic marks—one about half way down the wing, orbicular in shape; the other nearer the tip, reniform or kidney shaped. Fig. 4 shows "The Gothic Dart Moth" (*Agrotis subgothica*, Haw.,) with wings closed and expanded; this is a very common and injurious species, the caterpillar of which is too well known as the "Dingy Cut-worm."

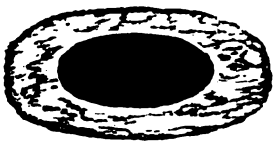

FIG. 3—COCOON.

FIG. 4—GOTHIC DART MOTH.

Cut-worms may be divided into three classes, according to their habits, and remedies must be applied in a slightly different manner for each. These classes are:—

1. Climbing Cut-worms, or those which climb trees and destroy the buds.

2. Surface Cut-worms, or those which live on the surface of the ground and cut off herbaceous plants just beneath the surface of the soil.

3. Those which combine both of these habits.

FIG. 5—AMPUTATING BROCADE MOTH.

Of the first class, a good representative is the Climbing Cut-worm (*Agrotis scandens*, Riley). The Dingy Cut-worm, the caterpillar of the Gothic Dart Moth (Fig. 4), belongs to the second class, and the "Variegated Cut-worm" (*Agrotis saucia* Treit.), and the "Yellow-headed Cut-worm," which turns to the "Amputating Brocade Moth" (*Hadena arctica* Bois.) (Fig. 5) are good representations of the third class.

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Remedies.—There are several remedies which may be used for cut-worms. For the climbing kinds, the best remedy is to place round the stem of the tree or bush to be protected, a strip of tin four inches wide, the lower edge can be pressed into the ground, and the tubular shape is easily preserved by securing it above with a piece of twine. This will effectually keep all cut-worms from the tree, for these heavy-bodied caterpillars are unable to crawl over the smooth surface. A similar expedient is to tie a band of cotton batting around the stem, as the caterpillars cannot crawl over this yielding material.

For surface cut-worms the most efficient remedies are the following:—

1. Keeping down all weeds in late summer and autumn, so as to deprive those species which hatch in the autumn of their food supply and winter shelter.

2. Burning off all the stubble and rubbish as late as possible in spring, when many caterpillars and the eggs of some species will be destroyed.

3. Placing some substance with an obnoxious odour around young plants when first set out, as fresh gas-lime, or sand or sawdust saturated with coal oil or carbolic acid.

FIG. 6—FIERY GROUND BEETLE.

4. Wrapping. Young plants may be protected in a large measure by simply wrapping a piece of paper around the stems at the time of planting.

5. Tomato cans with the tops and bottoms cut out, placed over the young plants, or strips of tin as suggested for Climbing Cut-worms, will be found to well repay the trouble and expense of procuring them.

6. Kerosene emulsions. Where these caterpillars occur in very large numbers, spraying infested beds with a kerosene emulsion at night has been found very beneficial.

7. Traps. Placing bundles of leaves or grass, poisoned with Paris green, between the rows of infested beds has been found a useful means of destroying large numbers of these pests.

8. Hand picking. When a plant is seen to have been eaten off, of course the cut-worm should always be looked for and destroyed. They will generally be found close to the root and about an inch beneath the surface.

In addition to the above artificial remedies, nature has provided the

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farmer with many useful and active assistants in the shape of various predaceous insects. Conspicuous amongst these are the Ground Beetles, which should be known by sight by every one, so that they may be protected, and not, as is too often the case, destroyed *because they are insects*. At Fig. 6 is shown the "Fiery Ground Beetle" (*Calosoma calidum* Fab.), a common and very useful species. Its colour is deep black with red (or sometimes green) glowing spots. The grub has been styled the "Cut-worm Lion," on account of its useful habit of destroying these pests.

CORRESPONDENCE.

AN EARLY BUTTERFLY.

Dear Sir: While driving in a cutter on 12th March, my attention was attracted to a butterfly fluttering around a farmer's house. Seeing it alight, I attempted to capture it, but although I got near enough to make sure it belonged to the genus *Grapta*, it rapidly flew across a wide field of deep snow and easily eluded pursuit. The weather was mild, and as far as my experience goes, this species is the earliest butterfly to appear in our vicinity; but I consider this particular record as somewhat remarkable even for *Grapta*.

Plover Mills, Ont. ROBERT ELLIOTT.

CAPTURES AT MONTREAL.

Dear Sir: During the past summer a few butterflies have been taken here which are perhaps worth noting. I took a *Pieris napi oleracea* on May 21, and half a dozen *Pyrameis huntera* and two *P. cardui* one afternoon in September. *Oleracea* is very local and has almost disappeared. *Huntera* is very rare, one or two specimens perhaps being observed each year, and *cardui* has been scarce since 1884, when the species appeared in great abundance. A specimen of *Feniseca Tarquinius* was taken in June and two in July of the previous year (1887). These are the only instances of its occurrence here.

E. C. TRENHOLME, Montreal.

Mailed June 5th.

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The Canadian Entomologist.

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THE NOCTUIDÆ OF NORTH AMERICA AND EUROPE.

(First Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

We have seen in several of my previous papers that the Owlet Moths, or *Noctuidæ* of temperate North America, the United States and Canada, resemble most strongly those of Europe. The divergence lies chiefly in the greater number of species belonging to the *Noctuidæ fasciatæ*, or *Catocalinæ*; and this is a tropical feature, such forms becoming more plentiful as we go southward, although *Catocala*, the typical genus of the group, does not seem to cross the equator, to which latter fact I have already called attention. Forms allied to *Pheocyma (Homoptera)* and belonging to this group, intrude into the European fauna, on the coasts of the Mediterranean. From the fact that the Southern States reach into the sub-tropics, the mountain chains forming no cross barriers, there is no impediment to the range of southern moths, and a greater number of species and genera of these extend into Canada and the north. The resemblance between the *Noctuinæ*, or *Noctuæ nonfasciatæ* of Europe and North America, can be traced in that the leading European genera are represented with us, and the species are even more numerous. Such leading genera, about which genera of less importance cluster, are *Apatela (Acronycta)*, *Agrotis*, *Hadena*, *Mamestra*, *Heliothis*, *Eustrotia (Erastria*, Tr. non Hübn). The genus *Catocala* has in North America its metropolis, where the number of forms, species and varieties reaches its maximum. The fact that the forms run very close seems to illustrate the observation that in the North-American fauna there exists an evident tendency to the differentiation, or throwing off of species. Instances of this may be cited in the Lepidoptera, in the genera *Argynnis*, *Colias*, *Papilio*, *Hemaris*, *Callimorpha*, *Datana*, *Clisiocampa*, *Scopelosoma*, among many others. As compared with the North-American species of

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Catocala, the European are fewer in number and comparatively better marked and distinct, standing farther apart from each other. The hardening process by which each species becomes more isolated in time, seems to have reached a more final stage with the European species of *Catocala*, etc. I have orginally compared the European *C. fraxini*, with the North-American *C. relicta*. I found differences in size and color between the two "representative" species, on the whole so slight as to warrant the belief that the two were derived from a common ancestral stock. We must seek for this ancestral stock in the tertiary, when its range probably extended over Northern or British America, and Siberia. A character which is distinctive of the present European species, is the dull blue median band of the secondaries. Now, I found, and first recorded the fact, that, in certain examples of the American form which has the band white, a faint blue edging to the band was found. This was a reversion to the original color in all probability. The tendency of color to become brighter and lighter in America, owing probably to atmospheric or climatic conditions, is thereby exemplified. The specimens of *C. relicta*, which have the forewings dusky, are also probably instances of this reversion. A form belonging to this group of the genus has been also described from California. It is doubtful, as yet, whether this can be considered a distinct species. The variation of the North-American forms has led to the publication of a number of names which, in some instances at least, are not properly founded. This "hardening into species" seems to be a natural process by which we may conceive the forms to become gradually more peculiar, different from their surrounding allies. At length the time may arrive when they disappear by extirpation, having given rise themselves to other species, through variation, their species-offspring surviving them.

From a classificatory point of view, the genus *Catocala* can hardly be held as "typical" of the *Noctuæ fasciatæ*, the more geometriform group of the family. Rather is *Pheocyma (Homoptera)* to be thus considered; the wings are unicolorous, and the darker rivulous markings extend over both pairs, while the secondaries are more or less exposed in repose. In *Catocala* they are hidden, and Lederer sees no necessity for any sub-family division. Probably the terms are to be used strictly for the convenience of students. The tibiæ are often spinose in these wide-winged genera, and this character, not unusual in the family, the *Catocalinæ* have in com-

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mon with the typical group of the *Noctuidæ*, where we see it in *Agrotis*, and a number of separated genera of smaller extent. This spinosity of the tibiæ is not frequent in the *Bombycidæ*, or in the *Geometridæ*; it is not so far apparent in the lowest group of the Owlet Moths, the *Deltoidinæ*. In the *Catocalinæ*, however, the body tends to become untufted and concolorous, the abdomen tapers to the tip, and the resemblance to the *Geometridæ* is further heightened by the looping larvæ.

Either from actual structural characters, or from the peculiar *form*, or as a matter finally of pure convenience for the student, I have divided the Noctuidæ into five sub-families: the *Thyatirinæ*, the *Noctuidæ*, the *Catocalinæ*, the *Deltoidinæ*, the *Brephinæ*. All these grounds for subdivision are recognized by modern systematists. The divisional terms help, as I have elsewhere said, to light up the group to enable us to compare the representation of the family in different quarters of the globe, and to arrive at conclusions relative to distribution and origin. For, on common sense grounds, I object to a classification absolutely technical and rigid; so rigid as to take no note of the plasticity of the forms, and so ignorant of the process by which a spine or a tuft is formed, as to be unable to determine categorically what characters are most difficult, or take more time to be produced in nature. The value of characters for systematic purposes may, therefore, stand in opposition to their biological value. A reasonable entomologist will therefore take note of *all* the facts presented, and will make his categories correspond, so far as possible, with the total qualities of the creatures he proposes to classify. The bare record of structure, and the erection of an artificial nomenclature is the smallest part of a naturalist's work. The thinking mind will discover the bearing of facts upon each other, and educe therefrom the action of natural law.

1.—Sub-family *Thyatirinæ*.

With the exception of *Pseudothyatira* and *Leptina* the generic representation of this group, which differs by the position of vein seven of the secondaries, is the same in Europe and North America. The former we may regard as a modification of *Habrosyne*, while the latter seems more removed from the different European generic groups allied to *Bombycia* (*Cymatophora* of Authors non Hübn). North America has one; Europe another, and Japan a third species of *Habrosyne*, so closely allied that they may be considered as geographical or representative species. These

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species run much closer together than the species of *Thyatira*; in the size, the characteristic wavy markings, they are nearly alike. Although, the European species of *Thyatira* is sufficiently distinct from *Bombycia (Cymatophora)*, so that the ground for these genera being placed together is not obvious until we compare the neuration of the secondaries, the American western representatives approach each other more nearly in external characters. Of the two genera, it is *Habrosyne (Gonophora)* which is most aberrant, most like the typical Noctuae, most like the genus *Plusia*. And I would here record a most singular fact: older European writers, as Meigen, etc., place *Thyatira* near *Plusia*. Probably the cut of the wing in *derasa*, and the tufts, together with the bright tints of both *batis* and *derasa*, influenced their decision. But there are no special resemblances between the species of *Plusia* and *Thyatira* in the European fauna. Now, in North America, we have two species of *Plusia*, which actually mimic species of *Leptina* and *Thyatira*. The first of these is *Plusia formosa* Gr., which so closely resembles a *Leptina* that, at the commencement of my studies, I described the type under this genus. I had my doubts, owing to the long *Plusia*-like labial palpi, to which I especially alluded. It so happened, that I at once returned the type to Mr. Treat, while I never afterwards saw a specimen, owing in part to the undoubted rarity of the species. I could not myself then subsequently make the correction, which was supplied by the late Mr. Morrison, (who was largely indebted to me for generic and specific determinations in the *Noctuidæ,)* in the Annals of the N. Y. Lyceum of Natural History. The second instance, as its name implies, is the *Plusia thyatiroides* of Guenèe, which, in its rosy patches on primaries, reminds one of *T. pudens*. Had these two forms occurred in Europe, they might have strengthened, or of themselves suggested the opinion that *Thyatira* and *Plusia* were allied. As it is, the case is one of the most singular which I have met with in the moths. It is to Hübner that we owe the more correct classification of this group. How much we do owe to this author! This fact alone, and that he has correctly limited the genera, should oblige us to retain Hübner's nomenclature in this sub-family. Writers, who themselves make mistakes in describing structure, should be more modest in their criticisms of Hübner.

The various genera into which the typical European forms are divided by Hübner, are probably valid: *Bombycia*, *Asphalia*, etc. As against

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the two European species of *Bombycia, or* and *ocularis*, we have two from the west coast, *improvisa* Hy. Ed., and *semicircularis* Gr. But the other European structural types seem to be wanting with us ; *Leptina* seems to be quite distinct from these, and an American outgrowth. The species described by Walker from the east, under *Cymatophora*, I have partly examined, and have corrected his generic determination, so that it seems unlikely that we have any eastern representative of the European genera. It would seem to be a proof that the west coast fauna more nearly coincides structurally with the European, that the typical European genus of this sub-family, *Bombycia (Cymatophora)*, occurs there, and not in the east of North America. There seems to be, finally, some doubt as to what the west coast species of *Habrosyne* really is ; whether our eastern *scripta*, which is rather unlikely, or a form identical with the European, which Mr. Hy. Edwards has suggested. While the species of *Pseudothyatira* seems to extend nearly, if not quite, across the Continent, our eastern *T. pudens* Guen. appears to be replaced on the west coast by *T. lorata* Grote. But I have seen no record of this species from California.

We may believe that the peculiar resemblance of the Californian and west coast fauna to that of Europe, has arisen partly in the fact that the preglacial fauna forced downwards during the Ice Age, has been on the west confined to a comparatively narrow strip between the Rocky Mountains and the Pacific Ocean, and that it has been exposed to lesser variation from migration. The temperature and food-plants necessary to many species are contained in narrower belts, with probably more abrupt confines, precluding the range of the species. Thus the original form may have been longer preserved.

I may conclude that this sub-family must be regarded as belonging to the Northern Hemisphere, and its representation in the New and Old World, as derived from a former circumpolar fauna. While certain generic forms found in Europe (at least two in number: the hairy-eyed *Asphalia*, and the naked-eyed genus of which *duplaris* is the type), do not apparently occur in America, we have, as an offset, the species of *Leptina*. We have also, in the more aberrant group of the sub-family, the peculiar genus *Pseudothyatira*, with its one species appearing in two forms, *cymatophoroides* and *expultrix*. On the whole, then, the representation of the *Thyatirinæ*, though probably without coincident species, is quite nearly equal in the New and Old World. For, if we have a representative

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species of *Thyatira* in the east and another in the west, so Europe has one peculiar species, and, beyond the Ural Mountains, in Siberia, there is found a fourth. All these species differ in size and markings, so that they are readily to be distinguished; while the pattern of ornamentation, pale or pink blotches on the brown primaries, is preserved throughout, perhaps most strongly contrasting in the European *Thyatira batis*, which English collectors call by the pretty name of "Peach Blossom." Our eastern species of *Habrosyne*, *H. scripta*, surpasses, I think, the European *H. derasa* in beauty; it was first described from Canadian specimens by the eminent naturalist, the late Mr. Gosse, after whom I have given it the English name of "Gosse's Arches."

A LIST OF THE BUTTERFLIES OF PHILADELPHIA, PA.

BY HENRY SKINNER, M.D., AND E. M. AARON.

Appreciating the value to students in geographical distribution of faunal lists of a given region, with notes thereon, and the interest that such lists have for beginners in the same field in after years, we have concluded to publish here a list of the DIURNAL LEPIDOPTERA known to us to have been taken in the vicinity of Philadelphia. A circle drawn around the new City Hall, with a radius of ten miles, is the line of limit to the "vicinity" here treated of.

We wish to disclaim any intention to enter into the question of synonymy in this paper, and have, therefore, implicitly followed the catalogue of Mr. W. H. Edwards, edition of 1884, as being the most complete and at the same time the most accessible to students. The collections of the Academy of Natural Sciences of Philadelphia, of the American Entomological Society, and of Messrs. Peale*, Ridings*, Wilt*, Blake, Laurent, Johnson, Keen, Bartholomew, *et al*, have been looked through by one or both of us, or their owners have been consulted as to their captures in this locality. Very few of the species here enumerated are unknown to us personally as natives of this region.

To this we have added a brief list of species heretofore accredited to this region on what seem to us to be doubtful or insufficient grounds.

* Now in the possession of the American Entomol. Soc.

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A few hitherto undescribed varieties have been given names, as we believe that any form sufficiently distinct to merit a characterization is worthy a distinguishing name. Such action, in our opinion, is in the interests of the science. A variety unnamed, or only indicated by a number or a letter of the alphabet, is much more likely to be ignored and subsequently redescribed than if it is at once elevated to the dignity of a recognizable name. *Papilio asterias*, var. *alunata*, is more likely to be respected than *P. asterias*, var. A.

Papilio ajax.—This species is said to have been found here in some numbers in past years. In a collecting experience of twelve years we have seen but three specimens. Pawpaw, its food plant, is scarce in this region. Nearly thirty years ago Mr. Newman reported rearing it in some numbers from the chrysalis.

Papilio philenor.—Occasionally common, but as a rule very few specimens are to be taken. During the season of 1888 a colony of larvæ was found here on the moon-vine (*Ipomœa bonei-nox*), a cultivated plant which is grown to a considerable extent in West Philadelphia. Most of these were infested by parasites, which, at this writing, have not emerged from their chrysalids. A feature of the unusually warm weather of the past winter was the finding of a perfect ♀ *Philenor* flying in Logan Square, opposite the Academy of Natural Sciences, on February 26th.

Papilio asterias.—Common and very variable. One very interesting variation we think worthy of description.

P. asterias, var. ♀, *alunata*, nov. var.—Type, American Entomological Society. Expands four inches; emarginations faint and nearly white; primaries apically produced, with but four sub-marginal spots, each one growing fainter as the last one in the lower disco-cellular nervule is reached; the spot between 1st and 2nd sub-costal nervures is faint; in the marginal row the spots are smaller and rounder. Secondaries: marginal lunules indicated very faintly, the blue between the nervures bright and well marked; no yellow spots internal to the blue, except the one at the apex, which is much smaller than the normal. Beneath: primaries as above, the orange spots usual in lower half of the sub-marginal row wanting. Secondaries with the sub-marginal row of orange spots very much smaller than in the typical form. No spot in the cell. In the collection of Dr. Skinner there is a striking specimen which differs from

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the type of *alunata* in that the lunate spots on the secondaries are normal except in colour, which is the same as those in *P. troilus*. The submarginal row of spots on the primaries is wanting, the first one very faintly indicated. In other respects it does not differ from *alunata*. Although the type specimen of *alunata* has no locality label on it, we have good reason to believe it to be from this region. The specimen in Dr. Skinner's collection was taken in Fairmount Park.

Papilio troilus.—Common.

Papilio turnus.—Common. Philadelphia seems to be about the latitude where the yellow and black *(glaucus)* females are found in equal numbers, and consequently, as is to be expected, interesting gradational forms have been taken here. A number of specimens of ochraceous females have been taken. One remarkable specimen was captured by Dr. W. L. Abbott at Chestnut Hill, and is now in the collection of Dr. Herman Strecker, of Reading. Perhaps the best way to convey a correct impression of its appearance is to say that were a black ♀ to be pasted over a yellow ♀ and the black then torn off in irregular shreds leaving the yellow to show from below, the specimen so treated would closely resemble this very striking form. The lines where the black and yellow join, while irregular, are abrupt. There is no flaking or commingling of the two colours. Another specimen, which, like the above, is believed to be unique, instead of being bi-laterally divided like those figured on plate 5, of Vol. II., of "Butterflies of North America," by Mr. W. H. Edwards, is divided antero-posteriorly. The primaries were *glaucus*, and the secondaries normal *turnus*. This specimen is also in the collection of Dr. Strecker.

Papilio cresphontes.—Occasionally taken. A fine pair have been seen in Fairmount Park, and several have been taken near Angora.

Pieris protodice.—*Pieris rapæ* seems to have pretty well supplanted the indigenous species *protodice*, the latter having been much more common some years ago. At the present time it may be said to be one of the rarer species. At Gloucester its food plant has been observed to be the common pepper-grass *(Lepidium Virginicum)*.

Pieris rapæ.—Painfully common. A number of specimens of a marked varietal form have been taken. They may be known as follows :—

Pieris rapæ, var. *immaculata*, nov. var.—Same size and form as the

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parent form, from which it differs in that it has no spots on the upper or under side of the primaries. Described from five specimens in the collections of Am. Ent. Soc., Dr. Skinner and E. M. Aaron.

Anthocharis genutia.—Rare. While this species has been taken at Westville, N. J., five miles below Camden, by Messrs. Newman, Wilt and Johnson at three or four different times in the past twenty years, we have searched for it unsuccessfully for a number of seasons past, in April and May, and have not succeeded until this season (May 6th) in capturing it—two female specimens. These we found flying over banks on which the white-flowered *Cerastium arvense* grew thickly. The food plant, *Sisymbrium thalianum*, though usually not common, is found there in considerable quantities. The locality is directly on the red clay banks of the Delaware, just west of Westville, at the point where the large shad nets are hauled in.

Callidryas eubule.—Exceedingly rare. Two or three specimens only are known to have been taken. It is, however, common in the pine barrens of South Jersey.

Colias eurytheme.—Very rare. The form *Keewaydin* has been taken in a few instances.

Colias philodice.—Common.

Terias nicippe.—Rare at Philadelphia, more plentiful below Camden, N. J. The food plants, species of *Cassia*, are not common in this locality.

Terias lisa.—Moderately common, but very local. Feeds on false sensitive plant *(Cassia nictitans)*.

Danias archippus.—Common. The caterpillar is usually infested with a dipterous larva, perhaps *Mascicera archippivora*. In some cases not one of a large number of caterpillars reaches the imago state.

Agraulis vanillæ.—Exceedingly rare. Probably only an occasional visitant. It is possible that it has been brought here in one of its early stages on its commonest southern food plant, *Passiflora incarnata*.

Argynnis idalia.—Plentiful some years; usually rare. On page 543 of his "Butterflies of the Eastern United States," Mr. Scudder states that "the female generally flies a little faster than one can walk hurriedly. The ample wings are flapped with great vigor, but do not seem adapted

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to swift flight." Dr. Skinner, in CANADIAN ENTOMOLOGIST, Vol. XIV., page 20, has already pointed out, that in this region the flight of the female "is exceedingly rapid, and generally in a straight line for about one hundred feet; then they do not alight on a flower or a bush, or flutter about like the male, but suddenly drop like lead in the long grass. It would be almost impossible to tell the exact spot where they alight, as they drop so suddenly, but on approach near it they are off like a shot again." Our observation, and that of a number of competent observers, consulted by us, substantiate the accuracy of the latter description of the habits of the female. It is more especially true of fresh females, which are being sought by the males.

Argynius cybele.—Common. Mr. Scudder, on page 560, says:—"The eggs are laid upon the leaves and stalks of the food plant, and not, as stated by H. Skinner, dropped from a distance upon the herbage." Dr. Skinner did not say or infer that this is the invariable habit of the insect, but simply recorded a single observation with the following comment:—"It remains to be seen whether this species always drops its eggs from a height, or only behaves in the peculiar manner occasionally while ovipositing." On page 562, Mr. Scudder asks:—"Is it possible that the female ever deposits by hovering in the air as Mr. Skinner reports?" Affirmative testimony, such as Dr. Skinner has given, is certainly, in a case of this kind, of greater value than any amount of negative testimony, and it should be added that Mr. G. H. Parker, now Instructor in Zoology in Harvard College, was present and also observed the actions of the female *cybele*, described by Dr. Skinner. Messrs. E. M. and S. F. Aaron have both also observed the same thing.*

Argynnis aphrodite.—Very rare.

Argynnis myrina.—Common in restricted localities. In the Proceedings of the Entomological Section of the Academy of Natural Sciences of Philadelphia, 1887, page 5, Dr. Skinner has described an interesting variation of both sexes of this species, found in Fairmount Park. These specimens are in the collection of Dr. Strecker.

* Since the above was written the authors have been favored with an opportunity at Westville, N. J., of observing *Argynnis myrina* following this same strange course in ovipositing. During this season also Mr. Aaron has detected *A. bellona* in the same habit, and he is strongly of the opinion that strange motions frequently observed in *A. diana* in Tennesse are to be accounted for in the same way, though at the times of observation they seemed quite unaccountable.

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Argynnis bellona.—Never very common.

Euptoieta claudia.—Rare.

Melitæa phæton.—Rare; very local.

Phyciodes nycteis.—Very rare.

Phyciodes tharos.—Common in its various forms.

Phyciodes Batesii.—Reported to have been not rare in this locality twenty years ago. Tryon Reakirt described it from types found at Gloucester, N. J. We are not aware of its capture of late years, except in two examples.

Grapta interrogationis.—Moderately common.

Grapta comma.—Not common.

Vanessa Antiopa.—Common.

Vanessa Milberti.—Exceedingly rare. Only two or three specimens known to have been taken here.

Pyrameis atalanta.—Very common. In this locality *Atalanta* generally feeds on false nettle, *Boehmeria cylindrica.*

Pyrameis Huntera.—Very common. Mr. E. M. Aaron has observed a female laying her eggs on the Canada Thistle *(Cirsium Arvense)*, in Fairmount Park.

(To be continued.)

THE ENTOMOLOGICAL CLUB OF THE A. A. A. S.

The annual meeting of the Club will be held at Toronto in the room of Section F., University of Toronto Building, beginning at 9 a. m. on Wednesday, August 28th. Members of the Club are requested to register at once upon arrival and obtain the Club badge. Those who intend to contribute papers are requested to send the titles to the President, Mr. James Fletcher, Government Experimental Farm, Ottawa, Ontario, or to the Secretary, Dr. D. S. Kellicott, Buffalo, N. Y. It is expected that there will be a large attendance and an especially interesting series of meetings.

The annual meeting of the Entomological Society of Ontario will be held at London during the following week. It is to be hoped that many of our visiting entomologists and associates will be present.

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DROVES OF LYCÆNID CATERPILLARS HERDED BY ANTS.

BY MRS. WYLLY, OF INDIA.*

The larvæ of *Tarucus theophrastus* Fabricus are cultivated and protected by the large, common black ants of Indian gardens and houses. The caterpillar, which varies in colour from light pure green to a dark reddish tint [this is a common variation in Lycænid larvæ], is about three-quarters of an inch long, louse-like in shape, and slow in movement, and it feeds on the *Zizyphus jujuba*, a small, thorny bush of the jungles with an edible, astringent, yellowish fruit, the "Byr-coolie" of the natives. Some Lycænidæ larvæ have the power of protruding and retracting at will two small, fleshy tentacles or horns, each tufted with a brush of fine hairs, from the upper surface of the tail segments. Between [on the next segment anteriorly] these tentacles is a small slit, from which they exude a small drop of a juice of some sort eagerly sought by the ants, and which they can generally procure by stroking the larvæ gently with their antennæ. The ants set up what appears to be merely a temporary nest at the foot of the tree, the better to carry on their operations. Just before the rains set in, about the middle of June, great activity among the inhabitants of a Zizyphus tree may be observed. The ants are busy all day long running along the branches and leaves in search of the larvæ, and without fail an ant will come to one full-grown, and meditating on the choice of a snug retreat [in which to turn to a pupa]. A friend or two turning up, the ants set to work to guide and drive their caterpillar in the direction they wish him to go, *i. e.*, down the stem of the tree towards their nest. This is not always an easy business if the prisoner is refractory and would prefer going somewhere else; but as a rule they are docile and easily led. Having kept guard over him until they get him safely into his proper berth in the row, and he has accepted their ultimatum as final, he drops off into a preliminary doze and undergoes his transformation into a pupa. If you gently scrape away the loose earth piled up at the base of the tree you will see some hundreds of larvæ and pupæ in all stages of development arranged in a broad even band all round the trunk and lightly covered with earth. The ants object to their being uncovered, and will immediately set to work to re-cover them, and if you persist,

* Reprinted from an article entitled Butterflies and Ants, by Lionel de Niceville, F.E.S., in the Journal of the Bombay Natural History Society, Vol. III., p. 164 (1888).

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they will remove all the chrysalids and bury them lower down. When the butterfly is ready to emerge, which is in about six or seven days, it is tenderly assisted to disengage itself from its shell, and should it be strong and healthy, it is left undisturbed to spread and strengthen its wings and fly away. But if, by any mischance, it emerges deformed and too crippled to use its wings, a catastrophe occurs. In one case, a butterfly had fallen to the ground before its opening wings had dried, and one of the soldier-ants tried to rescue it. He carried it back to the tree with the utmost care, and made several attempts to assist the butterfly to hold on again. Finding his efforts unavailing, he left the cripple for a short time to recover itself. On his return, seeing no improvement, he appeared to lose patience, and, rushing in, bit off both the deformed wings at the base, and carried off the wingless body into the nest below, whether as food for the community or for what other purpose I was unable to ascertain. That was the only occasion on which I ever saw any high-handedness on the part of the ants, though their usual ill-temper requires no very close observation to detect.

It is a curious sight to watch the fragile and delicate newborn butterflies wandering about, all feeble and helpless, amongst the busy crowd of coarse, black ants, and rubbing shoulders in perfect safety with the ordinary fierce big-headed soldiers; as odd a contrast as the fresh creamy whiteness of the opening wing, the flash of purple and blue, and the sparkle of green and silver eyes is to the darkness and dinginess of their queer home. For some time after the butterflies have gained strength to fly away, they remain hovering over the nest. A larva of a species of Catopsilia [one of the Pierinæ, or "Whites,"] I threw down as an experment, was immediately set upon and torn to pieces in a second by the ants.

I took a *T. theophrastus* larva from a tree, and introduced it on the pathway of another company of the same species of ants who lived in our verandah, but kept no "farm," and it was odd to see the ants come tumbling out headlong to fight the intruder, and the sudden way they cooled down on investigation of the foe; none attempted to harm him, and he was politely escorted across their boundary, the ants running alongside, and feeling him all over with their antennæ. This must have been instinct, as they could have no former knowledge of him as a "milk-giver." The dead chrysalids in an ants' nest are carefully removed and thrown away outside; the ants also distinguish between the dead and living.

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ADDITIONS TO THE LIST OF CANADIAN COLEOPTERA.

BY ALVA H. KILMAN, RIDGEWAY, ONT.

(Continued from page 110.)

3443—*Trogoderma tarsale* Melsh. Not rare.

3683—*Carpophilus antiquus* Melsh. Rare; under bark of dead maple and beech.

3686—*Colastus maculatus* Er. Rare; took three or four from the stump of a maple tree, cut while the sap was running.

3712—*Eupuræa peltoides* Horn.

3753—*Cryptarcha strigata* Fab.

3823—*Corticaria pumila* Lec.

3871—*Bactridium striolatum* Reit.

By placing chips on the top of fresh-cut stumps of maple, oak and other trees, and turning them from time to time, these last-named species are found. Attracted by the flowing sap, they hide under the chips and may be taken along with the more common species of *Nitidulidæ*, *Trogositidæ*, etc., in considerable numbers.

3987—*Ptilodactyla angustata* Horn. Swept from weeds. June. Not common.

3992—*Eucinetus morio* Lec. Swept from bushes. Muskoka. August.

4015—**Cyphon collaris* Guér. Rare; beaten from wild gooseberry.

4031—*Dromæolus basalis* Lec.

4038—*Dromæolus striatus* Lec.

These species, a few specimens of each, were got by beating. I have no record of the plant.

4097—*Cardiophorus convexus* Say. Not common on conifers.

4217—*Elater pedalis* Germ. Several taken in sweeping net.

4228—*Elater socer* Lec. Rare; found two under bark.

4229—*Elater rubricollis* Hbst. One by beating in July.

———*Elater ? macilentus* Rand. One taken on beech. June.

4290—**Agriotes oblongicollis* Melsh.

4305—*Melanotus longulus* Lec.

4335—*Melanotus tenax* Say. Taken occasionally by beating shrubbery. June and July.

4439—*Corymbites fulvipes* Bland. Rare on beech and maple. June.

4475—**Corymbites fallax* Say. Occasionally on thorn.

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4494—*Corymbites aratus* Lec. Two specimens on lake shore.

4542—*Drapetes geminatus* Say. I find these pretty little beetles in a certain locality each year on elder blossoms.

4666—*Actenodes acornis* Say. Rare; one specimen on oak.

4767—*Rhyncheros sanguinipennis* Say. Found one flying in a pine grove. Mr. Jas. White also got one on pine.

4820—*Pyropyga decipiens* Harr. Not rare; on beech and other foliage. June.

4911—*Podabrus corneus* Lec. One specimen; no record.

5177—*Clerus nigriventris* Lec. Quite abundant on pine brush. July and August.

5229—*Laricobius Erichsoni* Rosen. Taken on pine in May; quite common. This is the *L. rubidus* of the Toronto list and of Canadian collections.

5243—*Ptinus bimaculatus* Melsh. Three years ago I found one specimen crawling around in a cork-lined box used for duplicates. As I could not discover that my duplicates were infested, I did not overhaul the box. The following summer, June, 1887, I found two or three specimens of this interesting beetle in the same box. Since then I have kept it as a breeding place for this species, and in May, 1888, found several more specimens therein. I have no recollection of having ever placed in the box anything but Canadian beetles, and thus introduced it from abroad. The beetles submitted as food for the larvæ bear evidences of having been used as designed. Packard says that the commoner species, *Ptinus fur* Linn., is known to attack collections of insects.

5251—*Ernobius granulatus* Lec.

5254—*Ernobius luteipennis* Lec. Both rare on pine. June.

5289—*Vrilletta convexa* Lec. One specimen taken while beating. Mr. Ulke says:—"This is a California species; never before saw it east."

5339—*Sinoxylon basilare* Say. Rare.

5404—*Ennearthron thoracicorne* Zeigl.

5408—*Odontosphindus denticollis* Lec. Rare; swept from shrubbery.

5459*a*—*Onthophagus Orpheus* Panz. One specimen flying. August.

6011—**Callidium æreum* Newm. Two taken at Ridgeway on pine, one at Edmonton by Mr. White, and one at Hamilton by Mr. Johnston.

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6090—*Phyton pallidum* Say. I took a pair of these handsome little Longicorns on wilted leaves of red oak *(Quercus rubra)* July 12, 1887. It is rare indeed.

6183*a*—*Xylotrechus lunulatus* Kirby. Not common on hickory.

6209—**Microclytus gazellula* Hald. Several taken by Mr. Moffat at Hamilton. Three were taken here on hickory.

6609—*Bassareus detritus* Oliv. Several swept from foliage.

6671—*Pachybrachys trinotatus* Melsh. Not common; taken by sweeping with net, but I cannot say upon what plant.

6945*b*—*Oedionychis limbalis* Melsh. Beaten from leaves of ash and linden.

7003—*Systena blanda* Melsh. Rarely found in moss. March.

7534—*Hypophlœus tenuis* Lec. Not rare under bark of stumps.

7693—*Canifa pusilla* Hald. Quite common in fungi.

7698—*Nothus varians* Lec. Not common in crevices of bark on dead trees.

7840—*Mordellistena convicta* Lec. Found occasionally on thorn blossoms.

7900—*Xylophilus nebulosus* Lec. Taken while sweeping; rare.

7967—*Anthicus spretus* Lec. Not rare; by sweeping in wet places.

8364—*Apion erythrocerum* Smith.

8371—*Apion impunctistriatum* Smith.
These were found in moss in spring.

8427—*Phytonomus punctatus* Fab. Common on lake shore and in meadows. June to September.

8429—*Phytonomus setigerus* Lec. A pair taken by Mr. Jas. White, of Edmonton, Ont., on the sand near some stream or pond.

8440—*Listronotus sordidus* Gyll. Rare; on lake shore.

8567—*Onychylis nigrirostris* Boh. Occasionally found on the shore.

8575—*Endalus ovalis* Lec. Swept in numbers from the grass growing on the margin of a pond in the woods. August.

8582—*Lissorhoptrus simplex* Say. Common on the petals of the yellow pond-lily.

8607—**Otidocephalus Chevrolatii* Horn. Not rare on leaves of elm, etc.

8611—*Magdalis perforata* Horn.

8690—*Thysanocnemis helvolus* Lec. One specimen from foliage of hickory, July 26; this is a rare species.

8753—*Acamptus rigidus* Lec. Not common on lake shore.

8786—*Cryptorhynchus parochus* Hbst.

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8788—*Cryptorhynchus pumilus* Boh.

8795—*Cryptorhynchus fallax* Lec.

These kinds I find occasionally on the bark of dead linden, etc.

8820—**Acoptus suturalis* Lec. Quite common on hickory. June and July.

8834—*Cœliodes flavicaudis* Boh. Rare; swept from smart weed *(P. persicaria).*

8893—*Pseudobaris t-signum* Boh.

9071—*Pityophthorus cariniceps* Lec.

9223—*Brachytarsus alternatus* Say.

These three species I have taken rarely while sweeping.

PREPARATORY STAGES OF EUPLEXIA LUCIPARA, LINN.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

EGG.—Nearly spherical, flattened at the base, marked with about twenty-five longitudinal ribs and numerous transverse ridges, the former somewhat irregular and running to a depression on the summit; color whitish, with a circle around the middle and a spot on top of purplish-brown; these marks more or less confluent. Length about .5 m.m.

NEWLY-HATCHED LARVA.—Walks in the manner of a geometer, not using the central abdominal legs. It is of a whitish colour, with many black dots, from each of which arises a hair. Head, thoracic legs, and cervical spot, black. Duration of this stage about four days. When not feeding, the insect remains stretched out at full length on the back of a leaf.

AFTER FIRST MOULT.—Semi-transparent, whitish, with fine black dots as in the previous stage, a transverse row to each segment. Head whitish, mouth-parts black. Duration of this stage four days.

AFTER SECOND MOULT.—Differs from the preceding only in size. Duration, five days.

AFTER THIRD MOULT.—Whitish, a blackish lateral band with traces of dorsal and sub dorsal lines on first three segments. Black piliferous dots. Duration, six days.

AFTER FOURTH MOULT.—Much the same. The twelfth segment is somewhat thicker than the rest of the body. Semi-transparent, with the markings indistinct. Lateral line white, shaded with blackish above, the

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black dots encircled with white. Duration of this stage about seven days. At this period, the larva was observed to use all its legs in walking ; but the exact period when this power was acquired was not noted.

AFTER FIFTH MOULT.—The body now appears green. A row of white spots, one on each segment, above the interrupted sub-dorsal line. Duration about seven days.

AFTER SIXTH MOULT.—Head rounded and smooth, slightly depressed at the vertex, partly withdrawn beneath the skin of joint 2. Pale-whitish, mouth-parts darker. Body semi-transparent whitish-green ; a lateral white line edged with blackish above. On each segment to the twelfth, an oblique blackish shade, running back from the base, upward, and terminating in a white point on the next segment, these points forming a sub-dorsal row. The two points on joint 12 are nearer together and larger than the others. Joint 12 is thickened and larger than the other segments. There is an interrupted dorsal blackish shade with white points. Body furnished with thin, fine, short, whitish hairs. Duration of this stage seven days.

AFTER SEVENTH MOULT.—Mature larva. Similar to the preceding. Head slightly shaded with blackish above. The dorsal line appears as traces of a white dorsal stripe, edged with blackish on both sides, occuring in the fold between the segments. The color of the body is a darker, more velvety green, less transparent, but whitish beneath. There is a row of small whitish dots, one on each joint, above the spiracles, and another similar row between the dorsal and sub-dorsal lines. Each dot of both rows furnishes a short whitish hair. The two spots on joint 12 are quite conspicuous. Spiracles black. The larva rests with its body bent near the middle, forming a loop, the head touching the last segment. It feeds mostly at night. Length about 23 m.m. Duration of this stage about eleven days.

Pupation occurs in a very slight cocoon beneath the surface of the ground. There appear to be two broods annually, the winter being passed in the pupa state. This insect is common to America and Europe, according to Dr. Speyer.* Humphreys and Westwood give a figure of the mature larva,† and the same stage has been described by Edwards and Elliot.‡

* Entomologische Zeitung, Stettin, Vol. XXXVI., page 153.
† British Moths, Vol. I., plate 35, figure 5.
‡ Papilio, Vol. III., page 133.

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NOTE ON THE GENERA GORTYNA AND OCHRIA.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

I have lately had an opportunity of examining bred specimens of the European *Ochria ochracea (flavago)*. The clypeal tubercle may be felt with a fine pin or seen under the glass when the frontal scales are partly removed. We have two North American species agreeing with *Ochria*, viz., *Sanzalitae*, from California, and *Buffaloensis*, from the east. With the former, the European species has a nearer resemblance externally; our eastern species differing much in colour. The type of *Gortyna* Hüb., is *Micacea*, and the type of *Hydræcia* Guen., as indicated by an asterisk in the Species Genèral, is this same species. Consequently *Hydræcia* falls. The genus *Ochria* is used by Hübner for the sole species *flavago*, consequently this must obtain for the genus, which differs from *Hydræcia* of European authors mainly in the presence of the clypeal tubercle. While *flavago* resembles in colour several North American species of *Gortyna*, I may have overestimated its resemblance to our eastern *cataphracta*, although a resemblance certainly exists. The type of *Apamea* is now difficult to ascertain, but if, as I assume, it is really *nictitans*, it may give way to the earlier *Gortyna*, as the species do not seem to be generically separable. In CAN. ENT., XIV., 17, I gave a list of the North American species, which may be amended as follows:—

Gen. GORTYNA Hübn.
(= *Hydræcia* Guen.)

purpuripennis Gr.
juvenilis Gr.
erepta Gr.
immanis Guen.
obliqua Harv.
stramentosa Guen.
nictitans Esp.
var. *erythrostigma* Haw.
var. *lucens* Tr.
inquæsita G. & R.
cerina Gr.
rigida Gr.
impecuniosa Gr.
cataphracta Gr.
purpurifascia G. & R.
rutila Guen.
Harrisii Gr.
speciosissima G. & R.
cerrussata Gr.
marginidens Guen.
limpida Guen.
appassionata Harvey.
necopina Gr.
nitela Guen.
var. *nebris* Guen.
serrata Gr.

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Gen. OCHRIA Hübn.
(= *Gortyna* Led.)

sanzalitæ Gr. *Buffaloensis* Gr.

The genus *Gortyna*, as above defined, contains species of Noctuidæ, having the ♂ antennæ of various structure, fringed with hair, brush-like, in *serrata* pectinated. The front is smooth, thickly, somewhat woolly haired. Labial palpi short, with small terminal article. The thorax has an elevated scale ridge behind the collar, and a tuft behind, while the abdomen is stout and usually untufted. The eyes are naked, the tibiæ unarmed. The larvæ, so far as known, are internal feeders in roots and bulbs. They are livid or yellowish, with dark warts, and prothoracic shield; pupating in the ground.

CORRESPONDENCE.

PHALANGODES ROBUSTA (Pack.).

Dear Sir: Packard, in 1877, described this species from specimens taken in Colorado by Mr. E. Ingersoll in 1874, but the precise locality and habitat were entirely forgotten. In his recently published memoir on the Cave Fauna of North America (Proc. Nat. Ac. Sci., Vol. IV.), he redescribes the species, which is of extreme interest as being an out-of-door species of a usually cave-inhabiting genus, and suggests that it will probably be found under stones, though its precise manner of life, etc., remain as little known as in 1877. I am therefore pleased to be able to record that I have found a *Phalangodes*, agreeing quite well with *P. robusta*, in very considerable abundance by Swift Creek, Custer Co., Colorado, in damp places in a grove of *Populus tremuloïdes*, *always under logs*, and never, to my knowledge, under stones. This is about 8,200 feet altitude. I met with the same species under logs near Clearwater Creek, on the Grand Mesa, Mesa Co., at about 9,800 feet altitude.

May 31, 1889. T. D. A. COCKERELL, West Cliff, Colorado.

A NEW MYRMOPHILE.

Dear Sir: On pp. 165–166, Vol. xx., Dr. Hamilton gives a list of eight species of *Cremastochilus* known to be Myrmophilous. I can add one other, namely, *C. Knochii* Lec., which I found in an ants' nest on March 30th, last year, near Swift Creek, Custer Co., Colorado, at about 8,100 feet alt. This was under a stone on the open prairie.

T. D. A. COCKERELL, West Cliff, Colorado.

Mailed July 2nd.

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The Canadian Entomologist.

VOL XXI. LONDON, AUGUST, 1889. No. 8.

IBALIA MACULIPENNIS, HALDEMAN.

BY W. HAGUE HARRINGTON, OTTAWA.

The genus to which this very interesting species belongs differs so widely from the rest of the Cynipidæ that it has been separated from them as a sub-family, under the title *Ibaliinæ*. Its members can be readily recognized by the cultriform abdomen and more strongly veined wings, as well as by their greater size. The cultriform—*i. e.*, knife-shaped—abdomen is in itself remarkable enough to attract the attention of all who may chance to see the insects.

From Canada two species are recorded: *ensiger* Nort., ♀, and *maculipennis* Hald., ♀. The former I have not yet been able to find here, but Provancher (Faune Ent. Can., II., 554) records it as frequently seen. Both species were described from the United States (Pa.), with four others: *anceps* Say. (Ark.), *Montana* Cress. (Col., ♀), *rufipes* Cress. (Nev., ♀), and *scapellator* Westw. (Ga., ♂). The last is the only species of which the ♂ appears to be known. The present species was described by Haldeman (Proc. Acad. Nat. Sci., Phil, III., 127) as follows:—"*Ibalia maculipennis* ♀.—Yellow; meso and meta-thorax black, except the scutel and two longitudinal bands above, and a spot beneath the wings; eyes, apex of antennæ, base of coxæ and middle of femora (the greater part of the posterior ones) black; posterior tibiæ blackish toward the apex; wings yellow, apex and a central spot fuliginous. Seven lines long, eleven expanse. South-eastern Pennsylvania, in May and June."

A more detailed description of the ♀ is given by Provancher (Faune Ent. Can. Add., 165), and it is figured in the report of the U. S. Entomologist for 1877, but so far as I know there has been published no description of the ♂. It differs from the ♀, however, but slightly in general appearance, except in being darker in colour, especially the thorax. The abdomen is nearly straight above, instead of being curved as in the ♀, and the terminal segments are slightly swollen, so that,

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viewed from above, the apical third of the abdomen appears thicker than the middle segments.

The antennæ have 14 joints, those of the ♀ having only 13. The third joint is longer and considerable stouter than the succeeding ones, and is deeply and obliquely excavated on the outer side, a little beyond the middle. Can this groove be of any use for holding the antennæ of the ♀? The object of the present note is to call attention to the habits of the species, and to indicate where it may be looked for; points upon which little, if anything, is known, I believe. Mr. Ashmead, to whom I sent a pair of these insects, wrote to me in regard to them:—"I know nothing of the habits of the *Ibaliinæ*, excepting what Giraud wrote, "Il est tres vraisemblable que sa larve vit parasite de quelque grande Coléoptère lignivore.'"

The fact that an entomologist so well acquainted with the Cynipidæ, and the literature treating of them, had to make this admission, induces me to think that the few observations I have been fortunate enough to make (incomplete as they are) will be welcome to students of these insects, and may, perhaps, furnish a clue to enable other entomologists to work out the full life histories of the members of this anomalous and interesting sub-family.

My first acquaintance with *Ibalia maculipennis* was made in 1883, as I find by the following memo. in a note-book:—"June 28th. Two Hymenoptera, apparently ovipositing in maple." The note is illustrated by a rough sketch of the insect, sufficient to identify it. At this time my attention was given chiefly to Coleoptera, and other orders were only incidentally collected, so that no special value was attached to the observation. The following summer a specimen was taken on 26th June, but its label does not give any particulars, and no record of its capture is found in my note-book.

In 1886 I was fortunate enough to capture six specimens, of which three were ♂ and three ♀. My friend, Mr. Guignard, had taken a ♀ upon an old maple on 16th June, but it was five days later that I found my first two ♀ ♀. They were ovipositing upon an old, badly decayed maple; and in one instance the ovipositor was deeply inserted. Upon the same tree I captured another female, also ovipositing, on the 23rd June; and upon the same day secured my first male upon another old

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maple about 100 yards away. The other two males were taken on 25th June.

None of the insects were seen in 1887, although carefully looked for in that locality, but during the past season they were again observed upon a different kind of tree and in a different locality. On 10th June, Mr. Fletcher captured two females ovipositing in a beech, and on the 24th June, while with him we each took a female upon beech trees in the same grove. That taken by myself was dead, having met with an accident while ovipositing.

Having thus recorded the dates of capture of the specimens coming under my observation, a few remarks may be made upon the manner of oviposition. When the ovipositor is not in use it forms a complete coil within the abdomen, which is really but a flat sheath to contain it, and so transparent that it is perfectly visible. The triangular ventral scale, which is the full length of the abdomen, closes into it like a knife-blade into its handle, and the ovipositor is completely protected. When the ventral scale is deflexed the abdomen has much the outline of a lobster's claw, and the ovipositor when protruded is seen to be fully an inch in length, or longer than the insect itself.

During the act of oviposition, the insect, by means of its long legs, keeps its body far enough from the surface of the tree to enable it to deflex the ventral scale at a right angle to the body, with the tip touching the bark. A perfect support is thus formed for the ovipositor, which is gradually worked into the tree in much the same manner as that of *Thalessa*.

All the insects observed ovipositing have been on the trunks of large trees, at an average distance of about two feet from the ground. The six individuals seen in 1883 and 1886 were all upon old maples, near Hull, on the Quebec side of the Ottawa river. The trees were old and rapidly decaying (in two instances already dead), having a diameter of nearly two feet, and with the bark proportionately thick, so that the ovipositor was none too long to reach the wood, unless the insect availed itself of crevices in the bark. The insects taken last June were all ovipositing upon large beeches in a grove within the city limits, and within a few minutes' walk of my own house. Mr. Fletcher informs me that each of those captured by him had the ovipositor deeply inserted, and that he had much difficulty in pulling it out—breaking it, indeed, in one instance. My own specimen,

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as before stated, had died at its post, where it was held by the inserted ovipositor.

Here, unfortunately, our observations end, and we can only form conjectures as to the life of the larvæ. Provancher remarks of the genus that, "Their larvæ live as parasites in the body of other larvæ;" and with reference to *ensiger*, he says: "We have frequently met this insect in company of Braconids, upon trunks of dead fir-trees, searching without doubt to deposit its eggs in the body of lignivorous larvæ." His authority for the first statement is not given, but probably he has accepted the conjecture of some European Entomologist.

Prof. Riley has demonstrated, in the case of Thalessa, how unsafe it is to accept conjecture as fact, however probable it may seem. Still, in the absence of a complete knowledge of an insect's life, one must often fill in by conjecture the missing links, and wait for further investigations to prove their value. As regards *Ibalia maculipennis*, there are two ways in which the larvæ may live, viz., either directly upon the dead, or decaying woody tissues of the tree, or in or upon the bodies of larvæ which do so subsist.

The former course seems less probable, and I am inclined to think with those who believe that it is parasitic upon lignivorous larvæ. What species, then, is it likely to be parasitic upon? The maple trees upon which it occurs are badly infested by *Tremex columba*; *Xiphydria albicornis* and *Dicerca divaricata*, and in a less degree by other insects. The beech trees are also infested by the Tremex and Dicerca, and like the maples are much frequented by Thalessa. Is Ibalia parasitic upon its Hymenopterous (closely connected) relatives, or upon the Coleoptera?

Now that its time and place of occurrence are known, I hope that its history may soon be worked out in full. Its season of appearance is apparently brief, as all the specimens from this locality have been taken in June—the earliest upon the 10th, and the latest on the 28th. The insect might thus readily escape notice, even when not rare, as they are by no means conspicuous, either when ovipositing or crawling upon the rough trunks they frequent. But, if systematically searched for during the month of June upon old trees, they would probably be found by many of our entomologists.

While not abundant, these insects cannot be classed as especially rare, for besides the specimens mentioned in this note, I have seen several which

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were in the collection left by the late Mr. Billings, of this city, and which were probably captured in this vicinity. I have also found a ♂ among some *Hymenoptera* sent to me for examination by Mr. Evans, of Trenton, Ont., and have been informed by Provancher that a specimen (without abdomen) was shown to him some years ago at St. Hyacinthe, Que.

One female taken in 1883 had the cavity of the abdomen swarming with small mites, which also covered the ventral scale, and were thickly scattered along the protruded ovipositor. They appear to belong to species distinct from any yet noticed, although I have found many insects which infest decaying wood to be subject to the attacks of such parasites.

A LIST OF THE BUTTERFLIES OF PHILADELPHIA, PA.*

BY HENRY SKINNER, M.D., AND E. M. AARON.

(Continued from page 131.)

Pyrameis Cardui.—Usually common; some years quite rare.

Junonia cœnia.—Quite local; never very common. Mr. Scudder, on page 501, speaks of its "rapid, strong and enduring flight." This would seem to indicate that the habits of this insect in the New England States differ materially from those in this locality or further south. It is rare that this butterfly is here observed over a foot from the ground, and then its flight is most erratic, and usually consists of a few fluttering strokes of the wing followed by an idle sail. This is also the manner of flight from Virginia to Florida, according to the observations of E. M. Aaron.

Limenitis ursula.—Rare.

Limenitis disippus.—Common.

Neonympha canthus.—Rare. A few specimens have been taken near Gloucester, N. J.

Neonympha eurytris.—Common in restricted localities.

Satyrus pegala.—Exceedingly rare; taken at Mount Holly, N. J., by E. M. Aaron in 1884. It is recorded as from Gloucester, N. J., by the collectors of twenty years ago.

* The Authors wish to state here that as they belong to the two opposing schools in the matter of the capitalizing of specific names, they have left that matter to the judgment of the Editor. [The Editor sent the MS. unchanged to the printer.]

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Satyrus alope.—Rare; but few specimens known to have been taken nearer than Westville; also at Mt. Holly, N. J., where it is quite common at times.

Libythea Bachmanni.—Exceedingly rare. Two specimens taken in West Fairmount Park.

Thecla halesus.—Very rare. Two or three were taken some years ago near Westville, N. J.

Thecla M-album.—Mr. Edwards, in his catalogue of 1884, records this species from Pennsylvania; but, though taken on the New Jersey coast, we are not aware of its having been taken in this portion of our State.

Thecla humuli.—Not common.

Thecla calanus.—Not common.

Thecla smilacis.—Exceedingly rare.

Thecla Augustus.—Rare. Westville, N. J.

Thecla irus.—Rare. Only reported from Westville, N. J.

Thecla Henrici.—Rare. Westville, N. J.

Thecla niphon.—Rare. Fairmount Park and Westville, N. J.

Thecla Titus.—Exceedingly rare. Cobb's Creek.

Feniseca Tarquinius.—Very local; never common. As a sample of its extremely local distribution, it may be stated that at Chamounix, in West Fairmount Park, this species is found flying around one tree, where, perhaps, 90 per cent. of all known to us to have been taken in this vicinity have been captured. There are several large beech trees there on which considerable numbers of *aphidæ* are nearly always to be seen.

Chrysophanus hypophlœas.—Common. An albino form of this species was taken in Fairmount Park several years ago.

Lycæna pseudargiolus.—This species and its varieties are moderately common.

Lycæna comyntas.—Very common. Mr. Scudder quotes rather doubtfully the statement made by E. M. Aaron, in Vol. IX. of this journal, that this species was observed depositing its eggs on ragweed (*Ambrosia* sp.). Such, however, was the case.

Ancyloxypha numitor.—Common.

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Pamphila massasoit.—Local; never very common. Swamps west of George's Hill and Westville, N. J.

Pamphila zabulon.—Very local; not common. The form *hobomok* is not so rare; occasionally it is found in considerable numbers along Cobb's Creek. *Pochahontas* is a much rarer form.

Pamphila sassacus.—Very rare. West Park.

Pamphila Huron.—Exceedingly rare. Cobb's Creek.

Pamphila phylæus.—Rare. West Park and Cobb's Creek.

Pamphila otho.—The typical form is only known to have been taken in one example near the Bartram Garden. The form *egeremet* is not common, though occasionally taken in some numbers near George's Hill reservoir.

Pamphila Peckius.—Exceedingly common. An odd form of this usually very constant species was taken near Benedict Arnold's house, in East Park. It is characterized by a marked suffusion of the black ground colour above, leading to a nearly complete obliteration of the markings on the secondaries, and the greatly restricted area of the light coloured markings, beneath which stand out separate spots rather than suffused areas, as is usual.

Pamphila mystic.—Though this species is not known to have been taken in the immediate vicinity of Philadelphia, we have thought it well to record it as having been captured in several examples at Penn's Manor, above Bristol, Penn.

Pamphila cernes.—Very common.

Pamphila manataaqua.—Not common.

Pamphila verna.—Moderately common. The form *pottawattomie* has occasionally been taken here.

Pamphila metacomet.—Not common.

Pamphila accius.—Very rare. Cobb's Creek.

Pamphila panoquin.—Very rare. Cobb's Creek and George's Hill.

Pamphila ocola.—Very rare. Cobb's Creek and Eastwick's.

Pamphila Pontiac.—Very rare. West of George's Hill.

Pamphila Delaware.—In his orginal description, Mr. W. H. Edwards states that his types were taken in Philadelphia by Mr. Newman. This is the only authority that we have for attributing this species to our fauna.*

* Since the above was written, a single faded female specimen was taken, June 21st, by Master Joseph M. Aaron, at George's Hill Reservoir.

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Pamphila fusca.—Not common, but has been taken in limited numbers in West Park and at Cobb's Creek. Mr. Edwards gives only "Gulf States" as the locality.

Amblyscirtes vialis.—Rare. Very local.

Pyrgus tessellata.—Common. The form *communis* has been taken in some quantity at Cobb's Creek and Fairmount Park.

Nisoniades brizo.—Rare. Westville, N. J.

Nisoniades icelus.—Very rare. Three or four examples have been taken near West Laurel Hill.

Nisoniades ausonius.—Not common.

Nisoniades martialis—Very rare. George's Hill reservoir.

Nisoniades juvenalis.—Common.

Pholisora catullus.—Common.

Eudamus pylades.—Not common.

Eudamus Nevada.—Rare. Several specimens of this species have been taken in Fairmount Park. One of these is in the collection of E. M. Aaron, and, besides agreeing entirely with Mr. Scudder's description, has been determined as *Nevada* by Mr. W. H. Edwards.

Eudamus bathyllus.—Common.

There seems to be good reason to doubt the specific worth of these last three forms. It is quite likely that careful rearing will prove them to be forms of one widely spread species.

Eudamus lycidas.—Rare. Very local. Cobb's Creek and west of George's Hill.

Eudamus tityrus.—Very common.

Eudamus proteus.—Extremely rare. One specimen from East Park and two at Cobb's Creek.

In addition to the above list of eighty-six species the following are added here as accredited to this region, but are rejected by us on account of insufficient testimony:

Vanessa J-album.—In his latest work Mr. Scudder credits this species to our fauna as "'rare,' (Blake)." Mr. Blake informs us that he has

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only taken this species in one specimen in Venango County, this State, and is not aware whence Mr. Scudder derives his information.

Thecla acadica.—This species is also referred to this locality by Mr. Scudder, and Messrs. Blake and Edwards are quoted as authorities. We fail to find anyone who has taken it or knows of its capture in this vicinity.

Chrysophanus thoe.—This species is attributed to this region by Mr. Scudder as "'rare,' (Blake)." As in the case of *J-album*, Mr. Blake is sure that he has never seen the species in this locality.

Chrysophanus epixanthe.—In this case Mr. Blake is quoted by Mr. Scudder as stating that this species is "neither common or rare." Mr. Blake is not aware that it has ever been taken hereabouts, but he has taken it at DaCosta, N. J., thirty miles from Philadelphia, on the Camden & Atlantic R. R.

Hesperia unna.—This species, not yet incorporated in any of our catalogues, is described as a new species from "Philadelphia," by Carl Plötz, in his "Die Hesperiinen-Gattung Hesperia Aut. und ihre Arten." —Stettin Entomologische Zeitung, Vol. XLIV., p. 204, 1883. This species is not compared with any of its congeners, and the description is vague and meagre. It is placed between *brettus* and *phylæus* in Herr Plötz's arrangement of this genus. We are in doubt as to which of our known species it can be, but do not think it possible that it can be new.

While we feel, certainly with justice, that this list of eighty-seven species is a remarkable one for so restricted a locality, we do not suppose that it is entirely complete. If any of our entomologists can add to it or throw further light on the localities or numbers captured, we shall be glad to receive such information.

In closing, we desire to bear testimony to the great value of the work on our Eastern Butterflies, now being published by Mr. Scudder, a work that should be in the library of every student of the Lepidoptera. Our few critical allusions to this work above are made necessary, simply because the extreme care taken by Mr. Scudder to avoid error make those that have crept in the more observable, and, consequently, the more deserving of the pointing out.

Philadelphia, May 16, 1889.

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POPULAR AND ECONOMIC ENTOMOLOGY—No. 4.

BY JAMES FLETCHER, OTTAWA.

THE IMPORTED CURRANT SAW-FLY—(NEMATUS RIBESII, SCOP).

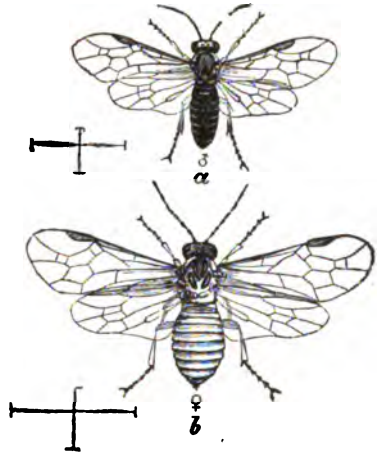

FIG. 7.

FIG. 8.

Amongst insects which every year make their presence noticeably apparent by their injuries, and thus win the distinction of being "First-class Pests" to the fruit-grower, not one, perhaps, is better known, nor, when not checked in its operations, more annoying, than the currant worm, the larval state of the imported currant saw-fly, *Nematus Ribesii*, Scop. (= N. ventricosus, Klug).

This is a European insect, which, although it has only been noticed in America for thirty years, has already spread over a large proportion of the settled parts. Early in the spring when the buds are bursting upon the currant and gooseberry bushes, active yellowish four-winged flies will be seen flying around the bushes or crawling over the unfolding leaves. These are the parents of the currant worms. The two sexes differ a good deal in appearance. At Fig. 7, they are both represented enlarged. The hairlines at the sides show their natural sizes. The male is shown at *a*. It is slightly the smaller, and is much darker in color. The head and thorax are almost black, with some dull yellow spots. The abdomen is dark above but yellow beneath and at the tip. The wings are glossy

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with dark veins. The males are equally abundant with the females, but are not so often observed, from the fact that they are seldom found on the bushes, but fly near the ground and beneath the bushes as if to welcome the females when they emerge from the soil, beneath which they have passed the winter in their snug cocoons. The females are larger than the males, and of a bright honey-yellow color.

The greenish-white glossy eggs which are about $\frac{1}{20}$ of an inch in length, are laid along the main ribs, beneath the leaves of gooseberries and currants, as shown at Fig. 8 (1). As soon as the young larvæ hatch, they at once attack the leaves upon which the eggs were laid, and eat small holes, as shown at Fig. 8 (2 and 3). They are very voracious, and their growth is very rapid indeed, little more than a week sufficing for them to pass through all their stages. These characteristics added to the large number of eggs laid by each female, make constant vigilance on the part of the fruit-grower a necessity, or he will find his gooseberry and currant bushes stripped of every leaf in a few days.

When the young larvæ come out of the eggs, they are about one-twelfth of an inch in length, with large heads and a semi-translucent body. At first they all remain on the same leaf, but as they grow large they separate and spread in all directions over the bush. They are green at first, then dark blueish green, covered with small black dots, each one of which bears a bristle, and lastly, after the last moult, pale green with yellow extremities.

When full grown they spin smooth oval brown cocoons, which, however, are sometimes of a greenish white colour. Those of the summer brood are generally on or near the surface of the ground, but at a considerable depth beneath it in the brood which passes the winter inside cocoons. The chrysalis state is assumed at once in the summer brood, and the perfect flies appear in about a fortnight. The autumn brood, however, passes the winter in the larval state inside the cocoons, and the larvæ only change to chrysalises a short time before the flies appear in the spring.

Notwithstanding that this insect is attacked by a host of parasitic enemies, it is generally necessary for the fruit-grower to apply active remedies. Of these, "White Hellebore" is the best. One or two ounces of this powder mixed in a little hot water at the bottom of a pail, and then

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filled up with cold water, will give a sufficient quantity of the mixture to sprinkle a large number of bushes. This is most conveniently done with an ordinary clothes whisk. The powder may also be used dry; when mixed with four times its bulk of common flour, it should be puffed over the bushes after rain, when the dew is on them, or after they have been sprinkled with water. This is most conveniently done by means of the small hand-bellows, now obtainable at all chemists. With regard to the danger of using this material, I will quote from an excellent and very complete article upon this subject by Prof. W. Saunders, which appeared in our Ent. Soc'y, of Ont. Rep. for 1871–2, p. 32.

"It has been urged against hellebore that it is poisonous, and great outcries have been made against it on this account. It is quite true that hellebore is poisonous when taken internally in quantities, but if used in the manner we have indicated, no fear need be entertained of the slightest injury resulting from it. Examined immediately after a thorough sprinkling with the hellebore mixture, the quantity on any bunch of fruit will be found to be infinitesimal, and the first shower of rain would remove it all. If it be found necessary at any time to apply the mixture to bushes where the fruit is ripe and just ready to be picked, it might then be washed in water before using, which would readily remove every trace of the powder. During the past ten years many thousands of pounds of hellebore have been used in Europe and America for the purpose of destroying this worm, and we know of no case on record where injury has resulted from its use."

Another insect of the same family, and with very similar habits to the above, is the Larch Saw-fly, *Nematus Erichsonii*, the larvæ of which are now spreading rapidly over the Eastern United States and Canada. I have received enquiries concerning it from several of our members in different provinces of the Dominion, particularly from Nova Scotia and Quebec. The eggs of this species are embedded in the soft wood of the young shoots of the tamarac when growth first begins in June. The growth is stopped on the side where the eggs are deposited, and the twig becomes distorted and is eventually destroyed. This injury, however, is slight compared with the destruction of the foliage. There are at the present moment in Canada, from the Atlantic coast as far west as Ottawa, thousands of acres of tamaracs entirely stripped of their leaves. In a later number a fuller account of this injurious insect will be given.

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ADDITIONS TO THE CANADIAN LIST OF LEPIDOPTERA.

BY J. ALSTON MOFFAT, HAMILTON, ONT.

These names I have obtained from various sources :—

Glæa inulta Grote.
Nonagria fodiens Guen.
Plusia Ni. Hub.
Acidalia insulsaria Guen.
Cymatophora humaria Guen.
Glaucopteryx cæsiata Borkh.
Botis adipaloides G. & R.
Eurycreon sticticalis Linn.

For the following I am indebted to the kindness of Prof. Fernald :—

Conchylis floccosana Walk.
Ecopsis olinaceana Fern.
Steganoptica fasciolana Clem.
Gelechia alasella Clem.
Gelechia bilobella Zell.
Gelechia vagella Walk.
Carposina cressentella Wlsm.
Blabaphanes dorsistrigella var. *flavivittellus* Fitch.

The collecting season of 1888 was, in this locality, somewhat peculiar. It opened up about the 10th of May with great promise—early moths appearing in considerable numbers. This was soon reversed—cool, dry weather setting in ; and not until the second week of June did the weather become warm enough to produce a marked development of insect life. About that time I obtained some fine moths new to me : several of them being but single specimens of a kind are yet undetermined. Fall hunting was quite productive of some kinds of good moths. I spent the first two weeks of September sixteen miles south of the city. I could find nothing of any value by hunting in daytime ; plenty would come to light when the evenings were warm ; but these were mostly so cool that it was necessary to keep the doors closed for comfort, thereby reducing my chances. It was at this time that I secured a pair of fine, fresh *Glæa inulta*, a large and handsome moth, and the first of the genus reported to have been taken in Canada. I got the name of it from Mr. Hulst, by sending to him a specimen that had been given to me by Mr. Hanham, which he had captured in Missouri.

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THE NOCTUIDÆ OF NORTH AMERICA AND EUROPE.

(Second Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

2.—Sub-family *Noctuinæ.*

Tribe *Bombycoidi.*

The sub-family *Noctuinæ* embraces the typical *Noctuidæ*, and we may take the genera *Agrotis* or *Hadena* as normal forms, from which we have a mass of more or less divergent structural groups. The characters which are made the basis of generic sub-division, according to a natural system which I find most plainly indicated in the writings of Stephens and Lederer, need not delay us here, for the reason that I have exposed them in previous writings. It remains for me to briefly point out that I have changed the basis for a classification of our North American genera from that of Guenèe to that of Lederer, commencing in my first synonymical list, Buffalo, 1874, to bring them together in a preliminary shape. When, nearly thirty years ago, I commenced my study of these forms, there were not a dozen species named in any collection, public or private, in America. In my last (MS.) list are over 1,500 names, and three-fourths of this number are taken from my descriptions or identifications. This represents continuous work; for large collections were not at first in existence, and the new forms came in singly, or in small parcels, and had to be classified; so that, from this fact, the generic determinations were often tentative. Added to this, the difficulty of determining the species described by Guenèe and Walker, and the absence of illustrations, produced a state of affairs in our knowledge of the *Noctuidæ*, which the student of to-day is largely exempted from. And *la verita è la pin ingrata delle dulcinee.*

The main mass of the *Noctuidæ* falls into three divisions, or sub-family groups, only separable by their comparative form. These are: the typical *Noctuidæ (Noctuinæ)*, the *Noctuæ nonfasciatae* of Borkhausen; the geometriform *Noctuidæ (Catocalinæ)*, the *Noctuæ fasciatae* of Borkhausen; and the pyralidiform *Noctuidæ (Deltoidinæ).* The fact that the latter are not separable from the *Noctuidæ*, and are not *Pyralidæ*, was first shown by Herrick Schæffer.

In *one* North American genus, I have shown that vein 5 is midway

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between 4 and 6 on the primaries. This is contrary to Lederer's definition, and, so far, is a single instance; vein 5 being, in all others examined by me and as laid down by Lederer, nearer 4 than 6 on both wings, while on the secondaries it is often weaker than the rest, or wanting. I do not feel sure that the neuration should absolutely guide us; it does not seem certain that, in the species not yet examined, it will precisely agree. The absence of an accessory cell is, in the *Noctuidæ*, exceptional, and as yet it cannot here, or in other families, be used as a character, except in a general way. In the *Sarothripinæ* and *Chloephorinæ*, for instance, subfamilies of the *Bombycidæ*, it seems to be wanting, as also in some *Lithosiinæ*, i. e., *Nudaria*; but, as a general character, it may be said to be either usually wanting or usually prevalent, until every species has been examined and the neuration compared, which is far from the case. In my papers I used it as a general character, not describing particular forms; hence, while the statement may be modified from a larger knowledge of the neuration of all the genera and species, it does not imply a distinct error, such as was committed in the original description of the neuration of the genus *Cerathosia*, where vein 5, on hind wings, was stated to be absent, whereas it is present, and where the configuration of the accessory cell and emanating veins on fore wings were inaccurately given. The neurational distinctions given by Lederer, will not, then, positively distinguish the *Thyatirinæ*, which, in other respects, seem true *Noctuidæ*.

The sub-family *Noctuinæ*, or typical *Noctuidæ* is, then, founded on comparative form, the hind wings being usually unbanded and the body hairy or tufted. I have divided it into various tribes, founded on comparative characters, grouping about some representative genus. The first of these is the *Bombycoidea* of Authors, in which the larvæ are hairy or bombyciform, and are often singular in appearance or habit. The moths often present some resemblances to the genus *Bombycia*, and again to the *Dasychininæ*. In this tribe the head is usually sunken, the labial palpi short, often hanging (and this character marks bombyciform moths); the thorax has a posterior tuft, while the legs are unarmed. This latter character will warrant my reference of *Copablepharon* to the *Agrotini*. The caterpillars make cocoons, and are 16-footed. The European genera *Diloba*, *Eogena* and *Clidia*, with single or few species, do not seem to occur in North America. If we have a true species of *Demas* (Mr. Morrison's *Demas* is a Hadenoid form), then this European genus has a

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representative, but I only know it from a description. The European genus *Trichosea* (for *ludifica* = *Diphthera*, incorrectly credited to Ochsenheimer, see Check List, 1876, p. 36) seems allied to the forms I have separated under *Charadra*, Walk. *Raphia*, Hubn, is represented by our two species, *frater* and *abrupta*—one with white, the other with fuscous or gray secondaries. Instead of *Panthea*, we have the American genus *Platycerura* of Packard, which has strong resemblances to the *Dasychirinæ*. In *Arsilonche*, we have either a representative or identical species. So far as this tribe is concerned, the resemblance between the faunæ may be considered nearly as great as in the *Thyatirinæ*.

Tribe *Apatelini*.

It seems difficult to separate the following genera from the preceding tribe. The labial palpi seem less dependent; there is still a posterior thoracic tuft, and the larvæ are still hairy or peculiar; some bore into wood or pith to pupate; a cocoon is generally made. But the form is smoother, approaching the typical *Noctuinæ*. *Diphthera* Hübn. (= *Moma* Auct., not Hübn.) has a representative species in our well-known *D. fallax*. *Apatela* Hübn, the typical genus, is resolvable into a number of groups, based chiefly on the larval form. I do not think that Butler is warranted in considering the species generically separable. He would refer the moths on this account to actually different families. But the moths are very similar in color and structure; and I consider the larvæ have undergone independent modification. The leading European groups are represented, and such species as the American *A. occidentalis*, *A. funeralis*, *A. vulpina*, described by myself, may be considered as a strictly "representative" species. The character of the genus is changed, and its limits perhaps reach with the Californian groups *Merolonche*, and the Eastern group *Eulonche*, not found in Europe. Our American forms outnumber the European three to one, and this preponderance will be found in most of the leading genera of the *Noctuidæ*, such as *Apatela*, *Hadena*, *Mamestra*, *Agrotis*, *Catocala*. Whether we can separate the *Bryophilini* as a distinct tribe, is doubtful. The passage seems to be formed by the American genera *Harrisimemna*, *Cerma*, *Polygrammate*, *Microcoelia*. These forms seem peculiar, as also the genus *Chytonix*, which follows *Bryophila*, although, I am not certain of this. Guenèe has apparently described the type as a species of *Apamea*, and thus related to *Hadena*. The thoracic vestiture is, however, more like that of *Bryophila*, a lichen-feeding genus of

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which we have one Eastern species, the *Bryophila lepidula* Gr. On the whole, the resemblance of the two faunæ is here, again, quite close. Genera with single species, peculiar to each fauna, occur, but the parentage is obvious, and but small modifications seem to be offered. These first tribes of the *Noctuinæ* seem to belong to the circumpolar element in our moth fauna, with the *Thyatirinæ*. The position formerly given by me to the American *Dicopini* seems susceptible of a change. If we place the *Agrotini* where Lederer puts them, these Dicopid genera, with a claw on the front tibiæ, seem to fall in better between the *Agrotini* with spinose, and the *Hadenini* with unarmed tibiæ. They have, especially *Dicopis*, a decided resemblance to the *Hadenini*; but the larvæ are apparently unknown, and may assist our classification by offering determinative characters.

The following table will assist in giving an approximate idea of the correspondence between the two faunæ. Allowance must be made that the North American fauna is less exhaustively known :—

EUROPE.	NORTH AMERICA.
Diloba 1 sp.	
Simyra 3 sp.	
Arsilonche 1 sp.	*Arsilonche* 1 sp.
Eogena 1 sp.	
Clidia 2 sp.	
Raphia 1 sp.	*Raphia* 2 sp.
Demas 1 sp.	*Demas* 1 sp.
	Platycerura 1 sp.
Trichosea 1 sp.	*Audela* 1 sp.
	Charadra 5 sp.
Panthea 1 sp.	*Momaphana* 1 sp.
Diphthera 1 sp.	*Diphthera* 1 sp.
Apatela 15 sp.	*Apatela* 54 sp.
	Harrisimemna 1 sp.
	Cerma 1 sp.
	Microcoelia 2 sp.
Bryophila 9 sp.	*Bryophila* 3 sp.

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OBSERVATIONS ON SOME NORTHERN DERBIDÆ.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

The small group of Homopterous insects included by Fabricius in his genus Derbe, but now separated as a sub-family from the other Fulgoridæ under the name of *Derboides Spinola* or *Derbida*, Stal, have always been objects of interest to students of this order, partly on account of their delicate form and peculiar structure, but their almost universal rarity has doubtless added much to their attractiveness. A series of these frail North American forms, differing in several respects from their tropical allies, were first made known in 1819 by Mr. Kirby, who arranged them under two genera—*Otiocerus* and *Anotia*, describing under the former eight, and under the latter one species; to *Otiocerus* three species from the United States were added by Dr. Fitch in 1851 and 1856, and one by Dr. Stal from Cuba, in 1859; to *Anotia* Dr. Fitch added three species in 1856. Thus, as the genera now stands, *Otiocerus* has twelve North American species, and *Anotia* four, but future study will probably result in placing two or three of these as mere varieties. As has been stated, *Otiocerus* was established by Kirby in a paper read before the Linnæan Society of London, in 1819. This paper appeared in Vol. XIII. of the Transactions, published as a whole in 1822, but probably somewhat earlier as a separate. In 1821, Germar, in the fourth volume of his *Magazin der Entomologie*, characterized his genus *Cobax* for a specimen of Kirby's *O. Stollii*, which he had received from Bahia, describing the species as *C. Winthemi*. Notwithstanding the fact that he claims the presence of ocelli for his genus, it seems to be equivalent to Kirby's *Otiocerus*, in which they are apparently absent, and is consequently placed as a synonym. In 1832, Burmeister, in his *Handbuch der Entomologie*, redescribed *O. Degeerii* as *Hynnis rosea*, differentiating his genus from *Otiocerus* by the extension of the elytra at their inner apical angles; but this character is now considered as of but subgeneric value at most. Genus *Anotia* was founded by Kirby on a single female example of *Bonneti*, and judging from a male in my collection, would seem to need modifying to include both sexes.

I propose in the present paper, after recording brief observations on a few species of *Otiocerus*, to describe a pretty little form occurring here, for which I find it necessary to establish a new genus, intermediate in character between *Anotia* and *Mysidia*.

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Otiocerus Degeerii, Kirby. This, our largest species, is not uncommon here through July, August, and September. In color it varies from pale reddish to brownish purple, but always shows the white line on the suture before the appendix, and at the tip of the elytra. The antennæ, which are comparatively small, have but one appendage in both sexes. The males are a little smaller than the females, and are less frequently met with.*

Otiocerus Stollii, Kirby. One specimen, a male, beaten from an oak near this city, August 18, 1888. This small species is of the same dark color we find in the preceding. A pale rosaceous vitta occupies the vertex, the middle of the thorax, and the elytral suture, as far as the tip of the clavus, beyond which is a pale line at the base of the appendix, as in *Degeerii*. The two carinæ, which are closely approximated on the point, diverge slightly just before the apex; on the vertex they are a little arched above the eye, and their edge is finely crenated. The antennæ are larger than in *Degeerii*. This insect must have a wide distribution, as it was described from Georgia by Kirby, and from Bahia, Brazil, by Germar. It is quite distinct from the *O. Stollii* of Spinola (*Ann. Soc. Ent.*, Fr. VIII., p. 385), and of Amyot & Serville (*Hemip.*, p. 514), which Dr. Fitch considers equivalent to his *Amyotii*.

Otiocerus Coquerbertii, Kirby. This, our most beautiful, as it is our most abundant species, occurs here with *O. Degeerii* from July to Sept. on various trees and bushes, especially on the beech, maple, oak, and hickory. Its two appendages exceed the antennæ in length. In size it approaches *Degeerii*, but represents another facies of the genus; distinguished by a pale ground color, relieved by a broad vitta of red or fuscous, extending from the tip of the head across the eye and thorax, and along the elytra near the suture to the tip of the clavus, where it forks, one branch bordering the internal apical margin, the other deflected to the apex of the costa. Their wings are clear or white, immaculate, and the frontal keels are approximate on the lower part of the face. Here belong *Signoreti*, Fitch; *Reaumurii*, Kirby; *Wolfii*, Kirby; and *Amyotii*, Fitch.

(TO BE CONTINUED.)

* Since writing the above, M. Provancher has (*Petite Faune Ent. du Canada*, Vol. III. *Hemip.*, p. 217, May, 1889) described an insect as *Amphixepa (!) Coquebertii*, referring it to Kirby's species with hesitation. From his description it cannot be the *Coquebertii*, but it agrees in every particular with pale examples of *Degeerii* that not infrequently occur here, and probably should not be considered as deserving even a varietal name.

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ON EARLY STAGES OF SOME LEPIDOPTERA.

BY WM. BEUTENMÜLLER, NEW YORK.

Chionobas Macounii, Edw.

EGG.—White, subglobose, slightly flattened above and below, with about seventeen longitudinal ridges, which are connected by numerous fine transverse ridges. Length, about 1.2 m.m. Width, about 1 m. Laid July 11. Emerged July 27.

YOUNG LARVA.—Head whitish, globose, rather large, finely punctured, mouth parts black. Body above bright pink, with a series of four whitish longitudinal stripes on each side; those on the dorsal region are very broad, with the intervening spaces very narrow. The lateral stripe very fine, and the one below the spiracles very broad. The spaces between these stripes rather broad. Spiracles black. At the posterior extremity of the body is a short, fork-like process. Underside of body pinkish, without markings. Length, about 2 m.m. Food-plant—Grass *(Poa pratensis)*. I very much regret not to have been able to raise the larvæ to maturity, but hope that Mr. James Fletcher, from whom I received the eggs, may have further notes upon this interesting species.

Ancyloxypha numitor, Fabr.

EGG.—Semi-spherical, yellow, rounded at the side and top, base flattened. After two days the egg became dirty-whitish, speckled with bright red. Length, about 1.5 m.m. Width, about .75 m.m. Laid on Grass *(Setaria op.)*, Sept. 8.

Arzama Obliquata, G. & R.

MATURE LARVA.—Head, subcaudate; rugose, chestnut brown, sometimes jet black; shining. Cervical shield, rugose, chestnut brown, sometimes black. Body above, shining olive brown, with numerous very fine transverse wrinkles, which are hardly visible to the naked eye; posterior segment much depressed. Spiracles black. Body beneath, dirty brownish white, including the abdominal legs, which have a chestnut brown or jet black patch on the outer side of each, and the extremities black. Thoracic feet chestnut brown or jet black. Length, about 55 m.m. Found several full grown specimens under decaying stumps, Sept., 1888.

Mailed August 1st.

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The Canadian Entomologist.

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SOME TEXAS, ARIZONA AND CALIFORNIA MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Ameria Texana, nov. sp.

Expanse .80 inch. Of the size and shape of *A. Unicolor*; the hind wings more rounded at anal angle, in that respect more like *Euphanessa Mendica;* body slender, antennæ pectinate; palpi slender, short, projecting beyond the front less than in *A. Unicolor*. Color uniform gray drab, the wings diaphanous, antennæ concolorous except the inside of pectinations at base where they are black, sides of head, back of eyes and a little at base of fore wings and abdomen slightly ochraceous.

Described from a single ♂ specimen from Hockley, Texas, from my friend Leopold Hartmann; his number 187.

Plusia Arizona, nov. sp.

Expanse 1.50 inches. Fore wings rich, shining, metallic golden, much like greater part of the wing of *P. Howardi*. It is marked with rich purple brown in three patches; the first basal triangular, small, reaching from the costa at the base to the posterior margin about one-fourth the distance from body to posterior angle; the second costal, quadrate, extending to median vein, one-fourth from base; the third costal, subquadrate, at the end of cell, partly within and partly beyond, spreading out towards apex; all three connected by a narrow costal margin of the purple brown. Fringe purple brown, cut with paler. Hind wings whitish, fringe the same, a dark hair line at base of fringe. Thorax pale as though purple brown washed with ochraceous, the ends of tufts darker; the outer patch on fore wings washed with ochraceous in its outer part.

Described from one ♂ from Arizona. This and another specimen were collected by H. K. Morrison in Arizona a number of years ago, and have been in my cabinet ever since. The other specimen may have been destroyed, as I do not find it now. This differs from *Howardi* chiefly in having one more purple brown spot. The basal spot or patch is broadest posteriorly, coming to a point on the costa.

Plusia Lenzii, Behrens, MS.

Expanse 1.60 inches. This species is related to *P. Scapularis* Hy.

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Edwards, in the position and somewhat the shape of the markings, but differs in color. General color fawn, with a purplish brown tint at the base above the cell and the basal portion of posterior margin. From the apex to the posterior angle extends a band about one-tenth of an inch wide of dark metallic golden, something of a golden sheen over the space from this band to end of wing ; from the cell to posterior margin, between the t. a. and t. p. lines, in a patch that is brownish yellow, more distinctly yellow below the silver spot, this shade extending a little over the golden band at anal angle, the patch shaded with purplish brown at posterior margin near t. a. line ; the most of the wing with a slight golden sheen. Silver spot short blunt boat-shaped, from median vein to fourth median veinlet. Posterior wings smoky, most prominent in terminal third.

Head and thorax fawn gray, hairs of second joint of palpi slightly rosy tipped, tufts of thorax with a brownish yellow tinge, the tips of scales of thoracic tufts and patagia lilac in side light.

Described from a single ♀ from Siskyon, Shasta county, California, taken by my friend James Behrens and by him dedicated to our our mutual friend, Dr. Henry Lenz, of Lubec, Germany.

Arctia Shastaensis, Behrens.

Since publishing the imperfect description of this form in the February number of the current volume of the CANADIAN ENTOMOLOGIST, page 35, Mr. Behrens has sent me a fine colored drawing of the specimen made before it was mutilated by travel, and from which the accompanying wood engraving was made. From the drawing I am inclined to think that it is entitled to rank as a species, as the species of *Arctia* go. It is certainly widely separated from *Achaia* by its shape and markings, and from *Behrii* by its size as well as markings. The light parts of fore wings are yellow, with a slight indication of orange ; the hind wings cherry red or near a crimson with black as indicated in the illustration. The abdomen is black on the sides and centre of dorsum with a subdorsal line of red. As shown by the antennæ and abdomen the specimen is a female.

Arctia Shastaensis, Behrens. Female—natural size.

Arctia Genura, Strecker.

Among some other specimens sent me by Mr. Behrens from Soda Springs, near Mount Shasta, California, are two other *Arctias* that I am

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inclined to refer to the above species. But two examples of *Arctia Genura* have, so far as I know, been taken before, one male now in Mr. Strecker's cabinet, taken by myself in Gilpin county, Colorado, at about 8,500 feet elevation, and another female in my cabinet taken at the same place by Miss Lillie Lake. If these be the same it shows a wide range for the species in the high altitudes. Both specimens have three transverse bands on the fore wings, arcuate, the first and second reaching the hind margin, but the third at a point below the longitudinal stripe. Neither has the basal half line, but one has a few pale scales on the costa the same as the female from Colorado. The light marks on the fore wings of one are yellow with a slight orange tint, the hind wings red with two rows of small black spots and a narrow terminal border; the other has the light part of fore wings yellow, less orange tinted than the other, and the hind wings yellow, but with the black the same as on the other. The abdomens are wanting, but from their appearance I take them both to be males. It is with some doubt that I refer these specimens to *Genura*, as there is no indication of a fourth or basal half transverse line except the few pale scales on the costa of the lighter one, and the spots on the hind wings of these are smaller than in the ♂ of *Genura*, as figured by Mr. Strecker; but the species of *Arctia* are generally so variable, and these come so near the typical *Genura*, that I prefer to refer them to this species provisionally to creating a new species.

Aegeria Pinorum, Behrens MS.

Mr. Behrens sends me a colored drawing and a description of an insect to which he gives the above name. It comes from Monterey, in *Pinus Insignis*, from which larvæ have been obtained. From these larvæ he bred one specimen from which the drawing was made. He says the larva lives under the bark of the tree, feeding on the inner bark and perhaps outer wood. From the wound made by the larva, there is quite a flow of resin, the pupa being formed in the inner flakes of this resin. By detaching such flakes of resin, five or six inches long, about as wide and more than an inch in thickness, pupæ and larvæ have been discovered nicely ensconced in rounded holes next to the bark.

The wings are vitreous with golden scales scattered over the surface, the veins dark; legs dark and golden; body steel blue with six golden bands, the last the terminal tuft.

Mr. Behrens did not state whether the specimen was a male or a female, but I think from the drawing it was a male.

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EARLY STAGES OF GRAPTA J-ALBUM.

BY SHELBY W. DENTON, WELLESLEY, MASS.

Since the food plant and early stages of *Grapta j-Album* appear to be unknown, perhaps the following notes (incomplete as they are owing to my ignorance of the species larvæ I was rearing) may still be of some value and shed a little light on the early stages of this fine butterfly.

On May 17th of the present year, while passing a clump of white birches I noticed a leaf, on the upper surface and at the extreme end of which clustered a number of small caterpillars. They were dark brown, almost black, in color, covered with black spines and not much, if any, longer than a grain of wheat. Not knowing at the time what species of Lepidoptera they would eventually make, I simply plucked the leaf and took no further trouble to look for others, or the empty egg shells of these which must have been near at hand, as they were apparently out but a short time.

There were fifteen in all, and these were easily reared by keeping in a jelly glass, feeding with leaves of white birch until they grew too large for the glass, when they were transferred to an ordinary rearing cage. During the earlier stages they moved about very little, feeding side by side, but remaining quite motionless in the middle of the day.

Previous to moulting the last time, they became quite dormant, each one selected a leaf, covering the upper surface more or less with silk, thus partly curling the leaf, thereby hiding themselves within, and with head downward, remained in this position till the desired change took place.

In this stage, and in fact all along, no two were alike in color, although there was a general similarity between them. Perhaps they can best be described as greenish underneath, while the whole upper surface was brownish or almost black, with the exception of two yellowish or whitish lines along the back. Between the segments they were pinkish in color, with the spines along the upper surface still black and branching, those along the side having changed to yellowish green. Length at this stage, about 1½ inches and not quite as large around as a lead pencil.

In the last stage, and before pupating, the caterpillar became a translucent green, the white streaks on the back faded or disappeared, the base of the branching spines became light colored and the dark upper surface became less in extent and much paler, not so decided.

On June 7th the first one spun a button and attached itself, and by June 12th all were in a chrysalis state.

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The pupa, after hardening, when held at arms length, appeared flesh colored, but on closer examination this tint was confined to the more exposed parts, and it was then seen to be of a beautiful clear green; yet they were not all alike in color, some being darker, some lighter than others, while several had a sort of bloom on them, as if dusted with flour, which gave them a whitish appearance, but all united in having six golden spots on their upper surface. Fully forty-eight hours before giving imago the colors of the future butterfly could be distinctly seen through the thin shell.

On June 20th, at 7 a. m., the first chrysalis gave a male imago, half an hour later another male followed, and by 7 p. m. nine had emerged, but of these only one proved to be a female. It was not till the butterfly appeared that I obtained positive knowledge of the species of insect I had been so fortunate as to rear, and then regretted the opportunity I had lost in taking full notes. I immediately sent one to Mr. W. H. Edwards in hopes it might reach him in the chrysalis state, and selected for this purpose the one last formed, but a postal from that gentleman a few days later informed me the imago had emerged while *en route*.

The following morning, June 21, two more had made their appearance, both females, and by 8 p. m. the remaining three, one of these proving a female, so that out of the fifteen I began with all were carried to the imago state without the loss of a specimen, except, perhaps, the one sent Mr. Edwards, which would doubtless have been perfect had it reached him in time.

I wish to call attention to the few females in comparison with the number of males (as I do not know the sex of the one sent Mr. Edwards that can be left out of the calculation), thus we have ten males and four females. That this proportion would hold good in a large number remains to be proven, but the uncommonness of the butterfly, as a rule, and the fact that none of mine were attacked by parasites, has led me to believe that it does, and possibly this may account for the scarcity of this fine insect. Also note that the males were the first to emerge.

The females can be distinguished at a glance, having the dark portion on the underside much lighter than in the male.

In conclusion :—It seems safe to say that the eggs are laid in small clusters in the latter half of April or first of May, and that search should be made for them at this time on the outermost leaves of the white birch, which is one, if not its only, food plant; that the larval state continues for at least three weeks, while that of the chrysalis about ten days.

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ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.

In pursuance of the call published in the CANADIAN ENTOMOLOGIST, in *Entomologica Americana*, and distributed by James Fletcher, President of the Entomological Club of the A. A. A. S., the following persons met in Toronto on August 28th, at 4 p.m.:—James Fletcher, Clarence M. Weed, A. J. Cook, L. O. Howard, John B. Smith, C. J. S. Bethune, H. Garman, W. Saunders, C. W. Hargitt, and others. Organization was effected by the election, upon motion of Prof. J. B. Smith, of Mr. James Fletcher as Chairman, and Clarence M. Weed as Secretary. Mr. Fletcher, in taking the chair, set out the advantages of organization, and urged the formation at the present time of an association that might be specially devoted to entomology in its economic aspect. Remarks to the same purpose were made by Prof. Cook, Prof. Smith, Mr. Weed, Mr. Howard, Dr. Bethune and Mr. Garman. After full discussion, Prof. Cook moved, seconded by Prof. Smith, that we do now decide to organize an "Association of Official Economic Entomologists." Carried unanimously.

Mr. Fletcher submitted a draft of a constitution drawn by Mr. Howard and himself, after consultation with others.

The proposed constitution was discussed clause by clause, amended and corrected, and finally adopted as a whole in the following shape:—

CONSTITUTION.

1. This Association shall be known as the Association of Official Economic Entomologists.

2. Its objects shall be: (1) To discuss new discoveries, to exchange experiences, and to carefully consider the best methods of work; also (2) to give opportunity to individual workers of announcing proposed investigations, so as to bring out suggestions and prevent unnecessary duplication of work; (3) to assign, when possible, certain lines of investigation upon subjects of general interest; (4) to promote the study and advance the science of entomology.

3. The membership shall be confined to workers in economic entomology. All economic entomologists employed by the general or State Governments, or by the State Experimental Stations, or by any agricultural or horticultural association, and all teachers of economic entomology in educational institutions, may become members of the Association by transmitting proper credentials to the Secretary, and by authorizing him to sign their names to this constitution. Other persons engaged in practical work in economic entomology may be elected by a two-thirds

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vote of the members present at a regular meeting of the Association, and shall be termed associate members. Members residing outside of the United States or Canada shall be designated foreign members. Associate or foreign members shall not be entitled to hold office or to vote.

4. The officers shall consist of a President, two Vice-Presidents and a Secretary, to be elected annually, who shall perform the duties customarily incumbent upon their respective offices. The President shall not hold office for two consecutive terms.

5. The annual meeting shall be held at such place and time as may be decided upon by the Association. Special meetings may be called by a majority of the officers, and shall be called on the written request of not less than five members. Eight members shall constitute a quorum for the transaction of business.

6. The mode of publication of the proceedings of the Association shall be decided upon by open vote at each annual meeting.

All proposed alterations or amendments to this constitution shall be referred to a select committee of three at any regular meeting, and, after a report from such committee, may be adopted by a two-thirds vote of the members present, provided that a written notice of the proposed amendment has been sent to every voting member of the Association at least one month prior to date of action,

(Signed) JAMES FLETCHER, CLARENCE M. WEED,
A. J. COOK, E. BAYNES REED,
JOHN B. SMITH, H. GARMAN,
CHARLES J. S. BETHUNE, C. W. HARGITT.
L. O. HOWARD,

The hour being late, Mr. Howard moved an adjournment to the 29th, after the meeting of the Biological Section of the A. A. A. S. Carried.

The Association met, pursuant to adjournment, at the call of the Chairman *pro tem*, at Scarborough Heights, near Toronto, at 4 p.m., Aug. 29th; the Chairman, Mr. Fletcher, taking the chair. On motion of Prof. J. B. Smith, seconded by Mr. L. O. Howard, the reading of the minutes of the meeting of the Committee organizing the Association was dispensed with, and resolved that the members present do sign the constitution as read and approved at the last meeting, and that by their action the Association of Official Economic Entomologists be, and is hereby duly organized. The following members then signed the Constitution in the order named:—James Fletcher, Chairman; A J. Cook; John B. Smith; Chas.

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J. S. Bethune ; L. O. Howard ; Clarence M. Weed ; E. Baynes Reed ; H. Garman ; C. W. Hargitt. The Secretary was authorized to transfer the signatures to the minute book of the Association, and to add the signatures of those who had expressed a desire to join in the work of the Association.

Letters were then read from Dr. F. Goding, Illinois, and Dr. J. A. Lintner, New York, expressing sympathy with and approval of the objects of the Association, and asking to be enrolled as members.

On motion of Prof. Smith, seconded by Mr. Weed, the election of officers was then proceeded with.

Prof. Smith nominated Prof. C. V. Riley as first President of the Association, stating that his recognized pre-eminent position as an economic entomologist, and his active interest in the work of establishing this Association, entitled him to the honor and recognition of the Association by election to that office. The nomination was seconded by Dr. Bethune and Mr. Weed, each stating the high claims of Dr. Riley to the position. On motion of Prof. Cook, seconded by Prof. Smith, Dr. Riley was elected by acclamation.

Prof. Smith nominated Prof. S. A. Forbes as 1st Vice-President of the Association. The nomination was seconded by Mr. Howard, and Prof. Forbes was elected by acclamation.

Mr. Weed nominated Prof. A. J. Cook as 2nd Vice-President of the Association. The nomination was seconded by Dr. Bethune, and Prof. Cook was elected by acclamation.

Prof. Cook then took the chair and the meeting was carried on under his presidency.

Mr. Howard nominated Prof. J. B. Smith as Secretary of the Association. The nomination was seconded by Prof. Hargitt, and Prof. Smith was elected by acclamation.

On motion of Prof. Smith, the President was authorized to appoint a committee of two to prepare such by-laws as may be deemed expedient, to be submitted for aproval by the Association at its next meeting.

Prof. Cook appointed the Secretary and Mr. Howard as such committee.

On motion of Mr. Howard, it was resolved that the next annual meeting of the Association be held at the time and place where the Association of Agricultural Colleges and Experiment Stations next meets.

On motion of Prof. Smith, the Society then adjourned.

JOHN B. SMITH, Secretary.

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

The following paper is presented in order to get into shape the notes made by me at odd times for the five years last past. It includes, in the first place, all the references that I found to the species during that time, and such notes of synonymic interest as I have culled from the publications examined. It has also been my practice, as specimens came into my hands, to use such as were unfit for the cabinet, for purposes of study, and I have thus accumulated a great many notes, which I see no opportunity of using for some time to come, inasmuch as my studies on the *Noctuidæ* will probably fill very completely all the time I have for systematic work. To present these notes for the benefit of those having more time to follow these lines of study, and to rid myself of the accumulated slips and memoranda, I have put them into this form. As some of the species are not known to me in nature, and as the sequence in Mr. Grote's list is based on no natural characters that I have been able to discover, I have arranged them in alphabetical order for convenience of reference.

Family ARCTIIDÆ.

The essential characters of the family are: Ocelli present, vein 8 of secondaries arising from the sub-costal at some distance from base. The former peculiarity separates them from the *Lithosiidæ*, the latter from the *Noctuidæ*. Usually, there is an accessory cell, but there are numerous exceptions to this. Typically, the venation of primaries is Noctuidous, save that the internal vein is not furcate basally. This, however, is a weak character. The secondaries are also very much as in the *Noctuids*, save for the origin of vein 8, which in the *Arctiids*, arises from the sub-costal instead of from the base. A somewhat well marked and characteristic feature is found in the loop of primaries receiving the frenulum of the male secondaries. It is very distinct and definite, arising from the space between the costal and sub-costal veins, and generally in the form of a heavy rope or band, reaching to the median space, where it is coiled to form a distinct ring into which the frenulum is inserted. In the female the frenulum consists of a bunch of three or more fine bristles, which are received into a loop formed of crossed scales in the median space of primaries.

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The front is flat, except in the *Cydosiinæ*, and the head is usually small. The tongue is variable, and quite often aborted or very weak. Thorax and abdomen are very variably developed. The antennæ furnish good characters for generic separation and sub-family groupings. They are sometimes very short, sometimes excessively long, and again moderate in length. In addition to what has been said of the venation it may be added, that two definite series are recognizable, based on the origin of vein 10 of primaries. In some genera it arises from the sub-costal before the end of the cell, in the others it is from the series at the end of the sub-costal. The legs afford good characters. The spurs of the middle and hind tibiæ are sometimes wholly or partly wanting, and sometimes the fore tibiæ are armed with spines or claws.

The genitalia will furnish excellent characters when studied. I have examined a number of species and find strong peculiarities. As the notes are too fragmentary and the characters need illustration as well as description, no reference is made to them.

Finally, it may be as well to disclaim completeness, either of references or description, though so far as the bibliography is concerned it is much more complete than anything heretofore presented.

Sub-family CYDOSIINÆ.

The characters of this sub-family have been given by me in the Proc. U. S. Nat. Mus., 1888, pp. 185-190. The produced tuberculate or roughened front constitute the isolating character. Vein 10 of primaries is from the sub-costal.

Genus CYDOSIA, Westw.

1841—Westw. in Jardine Nat. Lib., XXXVII, 193.
1854—Wlk., C. B. Mus. Lep. Het., II., 523.
1885—Moeschl., Stett. Ent. Zeit., XXXXVI., 206.
1888—Smith, Proc. U. S. N. Mus. XI., 187.

C. nobilitella, Cram.

1782—Cramer, Pap. Ex., III., pl. 264, f. G., *Tinea*.
1816—Hübner, Verz., p. 168, *Crameria*.
1841—Westw. in Nat. Libr. 37, p. 193, *Cydosia*.
1854—Wlk., C. B. Mus. Lep. Het., II., 523, *Cydosia*.
1866—H.-Sch., Corr. Blatt., XX., 119, is an *Agaristid*.

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1869—Grt. and Rob. Tr. Am. Ent. Soc., II., 186, *Cydosia.*
1872—Stretch, Zyg. & Bomb., 162, pl. 7, f. 8, *Cydosia.*
1882—Smith, Proc. U. S. N. Mus., XI., 188, *Cydosia.*
imitella, Stretch.
1873—Stretch, Zyg. & Bomb., 163, et. 242, pl. 7, f. 8, *Cydosia.*
1873—Grt., Bull. Buff. Soc. N. Sc., I., 36, *Aurivitta ?*
1888—Smith, Proc. U. S. N. Mus. XI., 188, pr. Syn.
var. *aurivitta*, Grt. & Rob.
1869—Grt. & Rob., Tr. Am. Ent. Soc., II., 186, pl. 3, f. 68, *Cydosia.*
1872—Stretch, Zyg. & Bomb., 163, pl. 7, f. 9, *Cydosia.*
1888—Smith, Proc. U. S. N. Mus., XI., 188, an var. pr.

The relation of these forms to each other is fully discussed in my paper in Proc. U. S. N. Mus., above cited.

The species from Texas.

Genus CERATHOSIA, Smith.

1887—Smith, Entom. Amer., III., 79.
1888—Smith, Proc. U. S. N. Mus., XI., 189.

C. tricolor, Smith.

1887—Smith, Ent. Amer. III., 79.
1888—Smith, Proc. U. S. N. Mus., XI., 190.

The recent discussion on the location of this genus is not referred to. Vein 5 of secondaries is very faint, but yet distinctly present. In my original description, made from a fresh slide, the thin balsam had obliterated the vein. The ease with which such errors are made in the venation is illustrated by the fact that ever since Herrich-Schaeffer first used venation as a basis for family characters, *Ino* has been credited with three internal veins, by even the best European students. I was the first to demonstrate by bleaching the wings and mounting in balsam, that one of these veins was a mere fold; on the other hand, this method has the disadvantage of obscuring the recognition of weak veins, and I was caught napping in this genus. My figures of venation in the Proc. U. S. N. Mus., are from camera drawings, and vein 5 was not apparent there. The presence or absence of the vein, is, however, immaterial so far as any influence over the family reference is concerned.

The species is from Texas.

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Sub-family ARCTIINÆ.

This term as here used embraces all the other *Arctiidæ*. I wish to say definitely, however, that I believe we have here at least three good sub-families, and the term is used here simply to separate off the *Cydosiinæ*, which have been properly limited.

Mr. Hy. Edwards uses the term *Pericopidæ* for the genera *Gnophæla* and *Melanchroia*, in Ent. Amer., III., 227, placing them between the families *Lithosiidæ* and *Arctiidæ*. Mr. Grote, in his "New List," placed *Gnophæla* between *Ctenucha* and *Harrisina;* genera, with which it has not even a habital, much less a structural resemblance, *Melanchroia* he omits altogether. I do not adopt Mr. Edwards's suggestion because I have not studied *Melanchroia*, and cannot find any satisfactory limit from *Gnophæla* alone. The group is rather tropical than temperate, *Gnophæla* being from the southwest and west, and *Melanchroia* still more typically southern—Key West, Mexico, Texas, Arizona. I place the two genera at the head of the series, on account of their *Lithosiid* tendencies.

Genus GNOPHÆLA, Wlk.

1854—Wlk., C. B. Mus. Lep. Het., II., 331.

1872—Stretch., Zyg. & Bomb., 35.

Omoiala, Grote.

1863—Grt., Proc. Ent. Soc., Phil., II., 334.

Lamprosina, Grote.

1863—Grt., Proc. Ent. Soc., Phil., II., pl. 6, f. 1.

Callalucia, Grote.

1866—Grt., Proc. Ent. Soc., Phil., IV., 315.

The ocelli are present, the eyes small, round and prominent, and the head as a whole, small. Tongue rather long and strong, palpi slender, drooping, with loose thin vestiture. Antennæ elongate, in the male heavily and lengthily bipectinated. Legs, subequal, smoothly scaled, the usual spurs small. Primaries with 11 veins, one of the series from the end of the sub-costal wanting, 3, 4 and 5 are from the median at the end of the cell, 5 rather close to 4, cell closed by a curved vein: 6 from the end of the subcostal on a very short stalk with 9, which runs to the apex and gives off one vein about half way to tip. Vein 10 is from the sub-costal before the end of the cell. Secondaries with 3 and 4 on a stalk from the end of the cell; 5 from a short spur cross vein, not far from the

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stalk originating 3 and 4; a curved continuation of the cross vein closes the cell; 6 and 7 on a long stalk out of the end of the subcostal, the stalk forking about half way to the margin; 8 out of the subcostal about one-third from base.

The above notes are from a male, *G. hopfferi*. The exact relation of the very variable forms of the species is not at all settled, and there may be more or fewer species than are now recognized.

G. hopfferi, Grt. & Rob.

1867—G. & R., Tr. Am. Ent. Soc., I., 332, *Gnophæla*.
1872—Stretch,* Zyg. & Bomb., 38, 236. pl. 2, f. 2, *Gnophæla*.
1881—Butler, Papilio, I., 129, *Gnophæla*.
1882—Stretch,* Papilio, II., 82, *Gnophæla*.
var. *discreta*, Stretch.
1876—Stretch, Lep. Wheelers Exp., V., 802, *Gnophæla*.

arizonæ, French.

1884—French, Papilio, IV., 20, *Gnophæla*.
1884—French, Papilio, IV., 112, = *discreta*.

Stretch gives the food plant as *Myosotis*. The insect has been taken in California, Arizona and Oregon (May 7 to June 1).

G. latipennis, Bdv.

1852—Bdv., Lep. Cal., Ann. Soc. Ent. Fr., 2nd ser., v. X., 320, *Glaucopis*.
1862—Morris, Synopsis Lep., 136, *Glaucopis*.
1872—Stretch, Zyg. & Bomb, 38, = *hopfferi*.
1882—Grote, New List 14, on sp. dist.
Habitat—California.

It is highly probable that Mr. Stretch is correct in referring *hopfferi* to this species; but as Mr. Grote still lists them as distinct, and I have not studied the forms myself, I follow Mr. Grote for the present.

G. vermiculata, Grote.

1863—Grt., Proc. Ent. Soc., Phil., II., 334, pl. 6, f. 1, *Omoiala*.
1865—Grt., Proc. Ent. Soc., Phil., IV., 316, *Callalucia*.
1867—G. & R., Tr. Am. Ent. Soc., I., 332, *Gnophæla*.

* This sign, whenever used with a reference, as above, indicates that the early stages were referred to.

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1872—Stretch, Zyg. & Bomb., 36, pl. 2, f. 1, *Gnophæla.*
1881—Butler, Papilio, I., 130, *Gnophæla.*
1888—Bruce,* Ent. Amer., IV., 24, *Gnophæla.*
var. *continua* Hy. Edw.
1881—Edw., Papilio, I., 80, *Gnophæla.*
Habitat, Colorado.

Mr. Bruce gives the food plant as *Mertensia virginica*, and the date in the Upper Platte Canon as July. The probabilities are that the species is double brooded, the first brood appearing in May, the larva of the second in July, imago late in July and early August.

Genus MELANCHROIA, Hübner.
1816—Hübner, Verzeichniss, 173.
1854—Walker, C. B. Mus. Lep. Het., II., 386.
1862—Clemens in App. to Morris Syn., 297.

This genus I have made no study of, although there is considerable material in the National Museum available for that purpose. Mr. Grote never included the genus in his lists and apparently considered it extra territorial. It is only within quite recent years that it has been placed by Mr. Edwards among the genera of our fauna, though Mr. Stretch recorded it in 1876 as found in Arizona. It is really a stranger to the rest of our fauna—an intruder from Central America—but it seems necessary to include it.

The bibliographical references to the older authors are all at second-hand, as, at the time I was studying their works and making notes, the species were not recognized as belonging with us. This is, perhaps, a good place to mention that, except where otherwise stated, all the references have been verified, and, barring errors in transcription and type, are correct.

M. cephise, Cramer.
1782—Cram., Pap. Ex., IV., 182, pl. 381, f. E., *Phalæna.*
1816 (?)—Hübner, Samml. Ex. Schm., II., Sphing, 17, ff. 1-4.
1816—Hübner, Verzeichniss, 173, *Melanchroia.*
1854—Wlk., C. B. Mus. Lep. Het., II., 387, *Melanchroia.*
1862—Clem., App. to Morris Syn., 298, *Melanchroia.*
1886—Edw., Ent. Amer., II., 9, *Melanchroia.*
Habitat—Texas, Arizona, Mexico, West Indies.

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M. geometroides, Walker.

1854—Walk., C. B. Mus. Lep. Het., II., 357, *Melanchroia.*
1886—Edw., Ent. Amer., II., 9, *Melanchroia.*
Habitat—Key West, Fla., West Indies.

There are quite a number of specimens of what I take to be this species, in the National Museum, from the Morrison collection, but they have not been as yet incorporated into the systematic series.

M inconstans, Geyer.

1837—Hüb., Zutræge, No. 431, ff. 861-862, *Melanchroia.*
1854—Wlk., C. B. Mus. Lep. Het., II., 389, (?) *Melanchroia.*
1860—Clem., App. to Morris. Syn., 298, *Melanchroia.*
1876—Stretch., Rept. Lep. Wheeler Exp., V., 802, *Melanchroia.*
secreta, Wlk., Cat. Lep. B. M., 222, supp., *Ardonia.*
1876—Stretch, Rept. Lep. Wheeler Exp., V., 802, pr. syn.
Habitat—Mexico, Arizona.

The synonomy is from Stretch, as are the bibliographical references to Walker.

Genus DARITIS, Walker.

This is also a recent addition to our fauna, made by Mr. Edwards. The Mexican form is not uncommon in its home, but the variety described by Mr. Edwards seems rare; at all events there have been very few specimens brought in. I have made no notes on this genus.

D. thetis, Klug.

1836—Klug., Neue. Schmett., IV., f. 1 and 2, *Euprepia.*
1886—Edw., Ent. Amer., II., 165, *Daritis.*
var. *howardi*, Edw.
1886—Edw., Ent. Amer., II., 165, *Daritis.*
Habitat—New Mexico, southward.

I have given none of the bibliography for the original species, as Mr. Edwards's description covers both species and variety.

From this point the order observed in Mr. Grote's list of 1882 is followed, not from any conviction that it is the best arrangement, but because it is easiest, and because for the present purpose any order will answer equally well.

(To be continued.)

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OBSERVATIONS ON SOME NORTHERN DERBIDÆ.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

(Continued from page 159.)

Otiocerus Wolfii, Kirby. A pale specimen of this frail little form was beaten by me from a beech tree September 3, 1888, at Lancaster, N. Y., and Mr. Uhler has kindly sent me a fully colored individual, presumably from Md., taken on the 6th of August. The antennæ in this species are very short, with a single appendage.

Otiocerus Signoreti, Fitch. I am indebted to Mr. W. J. Palmer, jr., for an example of this species, captured at Lancaster, September 14, 1888. It agrees with *Wolfii* in having but one appendage to the rather small antennæ. The white wings are faintly tinted with red and beautifully veined with the same color.

Amalopota, new genus.*

Form very slight. Head rather short, horizontal above, almost vertical before, with superior and frontal keels about as in *Anotia;* apex obtuse. Eyes of medium size, emarginate below. Ocelli two, distinct, placed below and very near the inferior angles of the eyes. Antennæ about as long as the head, situated at the base of the clypeus in a socket formed by a sharp, slightly elevated ring; basal joint very short and annular; second joint diverse in the two sexes; in the male, much flattened, with the sides almost parallel; in the female, shorter and slightly flattened; in both sexes papillated, with a subterminal emargination, from which springs a bristle. Clypeus triangularly ovate, convex. Rostrum long, reaching to about the middle of the venter; terminal joint very short. Prothorax linear above, produced in an acute angle between the eyes; on the sides, suddenly expanded to a broad, thin scale. Humeral scales large and prominent. Legs slender, unarmed, of medium length; the posterior femoræ somewhat thickened; posterior tarsi three jointed; basal joint longer than the second and third united. Elytra long and narrow, widest at the inner apical angle; apex broadly rounded, a little retreating posteriorly; the costal area expanded near the base into a broadly rounded, slightly recurved lobe; a slight constriction of the costa just before the apex, with a thickening of the veins there, produces the appearance of an imperfect stigma. Venation simple,† almost as in

* From:—ἀμαλος feeble, and ποτη flight.

† For convenience of comparison I have used Mr. Westwood's nomenclature of the venation.

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Anotia; costal area rather broad; mediastinal vein forked at the basal third; costal branch sending about two veinlets to the costa in the stigmatal region, and united by a cross vein to the outer fork of the inner branch, which is straight and twice forked just before the apex. Post-costal vein joining the mediastinal near the base and running straight to the apex of the elytra, parallel to the inner branch of the mediastinal vein; the long, straight cell thus formed is crossed by two veinlets, one at the apical third, the other near the apex. A cross vein joins the post-costal with the median vein near the middle of the elytra, beyond which the former sends five branches to the inner apical margin, the basal two of which are themselves forked near their apex, and united by a zigzag submarginal vein that reaches the claval suture; at this submarginal vein terminate the anal and the two branches of the median vein. The apical forks of the post-costal vein are united by slender cross veins, which with this submarginal vein form a series of about twelve apical and marginal areoles from the semi-stigma to the clavus. Wing:—Mediastinal vein simple, near the costa, which it touches at about the middle; post-costal vein bifid before the apex, and united by a cross vein to the mediastinal and median veins, the latter of which is also bifid. Abdomen short and broad, with a dorsal carina; showing five segments above and four beneath.

The vertex and front are so compressed into the superior and frontal keels that they might not improperly be described as wanting. These keels, as in *Anotia*, are united on the front and divergent posteriorly on the vertex, the included space being cut out to receive the pronotum. The mesonotum is convex and lozenge-shaped, the length scarcely greater than the width, which greatly exceeds that of the head; with three dorsal carinæ. Four anterior coxæ long and slender, placed obliquely; posterior short and thick. Base of the femoræ approximate. The genital pieces scarcely differ from those of *Otiocerus*.

This genus differs from *Anotia*, to which it is perhaps most nearly related, by the presence of ocelli, the greater length of the rostrum, the smaller number of veins in the stigmatal region, etc.; from *Patara* by the presence of ocelli, the greater length of the rostrum, the shape of the head and thorax, and the venation; from *Mysidia* and *Derbe* (Westw.), it differs in the single frontal carina, in the shape and venation of the wings and the form of the eyes, but agrees with the latter genus in the

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presence of the costal constriction (although less pronounced), and the length of the rostrum. The only genus described by Stal to which it need be compared is *Hulcita*, from which it is sufficiently differentiated by the presence of ocelli, the form of the vertex, antennæ, etc.

Amalapota Uhleri n. sp. Pale sanguineous. Elytra transparent, with the basal third and a broad band before the apex fuscous, the latter marked with sanguineous toward the costa. Whole insect, when fresh, covered with a white bloom, most conspicuous on the face and abdomen. Length—To tip of abdomen 3 m.m., to tip of elytra 8 m.m.; expanse of wing 15 m.m. Head—Keels of the front and vertex, viewed from the side, gently and regularly arcquated; vertex narrow, almost entirely cut out between the keels to receive the pronotum, which extends forward nearly to the middle of the eyes; extension of the frontal keels before the eye a little less than the width of the eye in the female, about half the width of the eye in the male. Rostrum extending to the third ventral segment, the last joint scarcely longer than wide. Antennæ of the female reaching to the tip of the head; second joint somewhat compressed, a little widened at the apex, which is obliquely and concavely truncated for the reception of the seta; in the male this second joint is a little longer and wider than in the female, and is much compressed, with the margins slightly thickened and the surface more distinctly papillated; a minute notch, almost at the end, bears a bristle a little longer than the width of the joint. In fresh examples, the *Ocelli* are liable to be obscured by the white bloom on the cheeks.

Thorax—Prothorax widened to an almost quadrangular scale behind the eye; central carina of the mesonotum inconspicuous; lateral carinæ almost obsolete. Elytra, when closed, extending about two-thirds of their length beyond the abdomen; basal lobe-like tooth minutely denticulate on its edge.

General color sanguineous. Head, thorax and antennæ fulvous, the latter suffused with pale sanguineous within the margin in the male; this color also invades the frontal keel, especially in the female. Keels of the vertex crested with white. Eyes dark brown. Clypeus pale fulvous. Rostrum white, tip black. Legs clear whitish, the posterior femoræ more or less invaded with sanguineous. Coxæ fading and white toward their tips. Abdomen in the male sanguineous, the basal ventral segments paler; in the female deep sanguineous, or even brownish-purple, darker

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along the crest; posterior edge of the ventral segments and genital pieces pale, the valves above fulvous.

Elytra transparent; basal third smoky-brown, omitting the humerus and costal region; a broad brown band occupies the apical third of the costa, and narrows to about one-half this width at the internal apical angle; this band includes a clear spot on its costal base, and omits about six of the apical areoles. In the female, this costal, clear spot is much larger than in the male, and coalesces with the clear, apical areoles. The veins are sanguineous within the limits of the brown, apical band, and in the stigmatal region are broadly bordered with the same color; this color also appears in the veins of the basal brown patch in deeply colored examples. Wings clear, with a smoky tip, and a larger, slightly suffused, area at the base.

Described from five individuals—a pair taken *in coitu* Sept. 3rd, 1888, two females taken the same day, and another female taken by W. J. Palmer, Jr., of this city, a week later, all at Lancaster, N. Y. Three of these were beaten from maples, and two from uncertain trees—probably maple or beech.

I take pleasure in dedicating this beautiful little species to our leading American Hemipterist, Mr. P. R. Uhler, whose disinterested and unfailing kindness has been an inspiration and help to me in my studies of these insects.

CORRESPONDENCE.

GRAPTA J-ALBUM.

Dear Sir: Having heard that the larvæ and food-plant of *Grapta j-album* were unknown, I thought that I should do well in informing you, since you could best make known my little discovery, that I have bred the butterfly from young larvæ, which fed on silver birch *(Betula papyrifera)*. Not knowing what they were, I neglected to make a long or careful description of them; nevertheless, I hope the following observations may be of some value:—The larvæ were black, with two dorsal, two sub-dorsal and two super-stigmatal rows of white spots and smudges, three or four on each segment,* with one dorsal and two sub-dorsal rows of shining black, branching spines; two super-stigmatal rows tipped with red, and two sub-

* There were also other smaller white spots scattered over the body.

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stigmatal rows pale red. Underneath yellowish-green, and in some places reddish, speckled with white; 12th segment reddish, both above and below; head black, and covered with many hard, white, conical tubercles, or short spines; somewhat cordate, with two thick, black, branching spines at the upper corners like horns. The chrysalids were about one inch long, pale green or light brown, sometimes with a reddish tinge, with two sub-dorsal rows of tubercles, eight in each row, the first six of these being bright, shining silver (in some lights gold) in colour. Like the other Grapta chrysalids, they were suspended by a button of silk at the tail. Before the imagos appeared, the colour and venation of the wings could be seen through the transparent outer covering. I found them on the 26th of May, 1889, when they were about eight inches long. On the 9th of June, they were two inches long. They moulted three times, and their appearance remained almost unaltered. They hung themselves up on the 13th of June, being then about 2.25 inches long, and on the 14th transformed. The imagos appeared on the 29th and 30th of June. I had altogether eight of these larvæ. The following is a description of a variety of the same larvæ taken at a later date:—On the 16th of June, I found the larva feeding, like the former batch, on the silver birch. Length about one inch. On the 17th it moulted, after which it was 1.5 inches long; colour purplish white and amber, with a dorsal band of white clouds, and some on the sides; white underneath; one dorsal, two sub-dorsal, two super and two sub-stigmatal rows of branching spines on segments 4 to 11, 2 to 11, 2 to 12 and 2 to 11 respectively. These spines were supported by tubercles, and the dorsal, sub-dorsal and super stigmatal were black, except the last two super-stigmatal; the rest were yellow and white. Head somewhat cordate and pale white, with two black branching spines at the upper corners like horns, and covered with small conical tubercles; upper corners black, and a dark mark like an inverted V over the jaws. On the 23rd it moulted again, after which it was light green, with two dorsal bands, more or less distinctly separated, of white clouds, and some white lateral markings; spines black, except the super-stigmatal, which were brown and amber, and the sub-stigmatal, which were pale green and white; the spine tubercles were orange yellow; head white, and covered with small, white, conical spines; spiracles black. It was largest at the 7th segment, segment 1 being very small; length about 1.75 inch. The chrysalis (June 29th) was green, with a rosy tinge and rosy markings, and with two dorsal rows of tubercles, 16 in number, the first six being shining silver in colour; about one inch long, with a large dorsal lump and two smaller lateral ones, and two at the head; black markings on last segment. On the 9th of July the imago appeared. Note that in this, and in the former description, the head is *not* counted as the first segment.

PERCY M. DAWSON, Montreal.

Mailed September 6th.

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The Canadian Entomologist.

VOL. XXI. LONDON, OCTOBER, 1889. No. 10.

THE ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Annual Meeting of the Society was held in the lecture room of the new Biological Building of the University of Toronto, on Tuesday, September 3rd, 1889. The President, Mr. James Fletcher, of Ottawa, took the chair at 11 o'clock a.m. The following members were present:—Mr. E. Baynes Reed and Mr. J. M. Denton, London; Mr. J. Alston Moffat, Hamilton; Dr. Brodie, Dr. White, Masters O. and W. White, Mr. Gamble Geddes, Mr. A. Blue (Department of Agriculture), Toronto; Rev. C. J. S. Bethune, Port Hope; Mr. W. H. Harrington and Mr. R. Bell, Ottawa; Mr. H. H. Lyman, Montreal; Rev. T. W. Fyles, Quebec; Rev. W. A. Burman, Winnipeg; Mr. L. O. Howard, Assistant Entomologist, Department of Agriculture, Washington.

The minutes of the previous meeting having been printed and circulated among the members, reading of them was dispensed with, and they were duly confirmed.

The President then delivered his annual address, in which he referred especially to the chief insect attacks of the year. It will be printed in full in the Annual Report of the Society. A cordial vote of thanks for his able and interesting address was unanimously voted to the President on motion of Dr. Bethune, seconded by Mr. Reed.

In the discussion which followed Dr. Brodie stated that he had found several cereals injured by Thrips; he discovered what were probably the larvæ of Thrips feeding under the sheath on culms of grass, but when kept over night no specimens would be found in the morning. He and Professor Wright had examined the insects and came to the conclusion that they were Thrips. The larvæ were exceedingly difficult to mount for the microscope; if preserved in balsam they soon faded out and became useless, but better results followed the use of glycerine. He was satisfied that there are two broods in the year, the first being early in the season. This year, owing to dry weather, they were very abundant

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in waste places, and he found about one-half of the timothy destroyed by them; after the rain set in the injury was very much reduced.

Mr. Geddes spoke of some variations in size that he had observed in the common yellow butterfly, *Colias philodice*, and expressed his opinion that the large specimens fed on clover and the small on lucerne.

Mr. Howard (of Washington) gave an account of the success which has attended the efforts of Dr. Riley and himself to introduce parasites of the Fluted-Scale insect (*Icerya purchasi* Maskell), a very destructive creature in California. This noxious insect had appeared very suddenly in the State, from where no one knew. Experiments were made upon it, and remedies proposed, but the cultivators did not seem to care to make use of them on their plantations. They then set to work to learn its life-history, and soon found that it came from Australia. They corresponded with Mr. Percy Crawford regarding it; he found the insect in Australia, but it was not at all abundant; they concluded, therefore, that it was kept in check by parasites. A dipterous parasite was found by Mr. Crawford. Their next proceeding was to send Mr. Koebele to Australia. He found the insect everywhere, and observed that it was very commonly parasitized. He then sent over about 15,000 living specimens of parasites; these were liberated at Los Angeles. He also found a "Lady-bird" (*Cocinella*) feeding on the scale-insect, and sent several thousand of them. The result has not been satisfactory with the dipterous parasite, as it breeds too slowly, but one of the species of Lady-birds breeds most rapidly, and will no doubt keep the pest within due bounds. As an instance of this he mentioned that 400 Lady-birds were sent to one planter, Colonel Robins, in May last; he thought from their satisfactory work that his orchard would be free from the pest by the close of the summer, but he afterwards wrote to say that on the 15th of August there was not one living scale-insect left. The experiment had been entirely successful. Mr. Howard also referred to the importation of the parasites in 1883 of the cabbage-butterfly, *Pieris rapæ*.

Dr. Bethune gave an account of his attempt to import from England many years ago the parasites of the wheat midge, and of the failure of the effort.

Dr. Brodie was strongly of opinion that noxious insects should be fought by means of parasites; that this was the true scientific method,

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and that the use of poisons was a grave mistake. He was very much gratified with the account of the methods adopted at Washington, and hoped that they would be developed to the utmost.

Mr. Fletcher, in reply, said that we could not possibly ignore the great value of poisons as remedies against noxious insects; that it was absolutely necessary to use them until we can depend upon the parasites; and that even if we had the parasites at work upon our destructive insects they might at any time be swept away through a mildew or blight, and we should be left at the mercy of the enemy. He had been in correspondence with Mr. Whitehead in England in order to procure the parasite of *Diplosis*, but unfortunately this gentleman was ill and unable to carry out the project. He had found nearly all the specimens of scale-insects *(Aspidiotus)* sent to him from British Columbia were parasitized, but had never found one affected in this way in Ontario.

Dr. Brodie thought that the farming community could never be brought to adopt scientific methods for the protection of their crops till they had suffered from a sweeping destruction. He referred, as an example, to the ravages of the wheat midge some years ago. In the County of York it wrought so much havoc that the wheat fields were deserted and left to the cattle; a day's threshing would produce two bushels of midges and no grain. When their crops were all destroyed then they were willing to resort to remedies, chief among which were the employment of the "midge-proof wheat" for seed, a judicious rotation of crops, and planting too early or too late to suit the habits of the midge. The introduction of new varieties of wheat was the principal means of getting rid of the pest. He wished that the farmers might lose all their potatoes in order that they might be led by this severe lesson to give up the use of Paris green and adopt scientific means of saving their crops.

After some further discussion, in the course of which the value of various poisons, such as arsenical preparations, hellebore, kerosene, etc., in checking insect ravages was insisted upon, the subject dropped.

Dr. White exhibited to the meeting some cheap wood cuts in outline of botanical subjects that were used in illustration of popular articles in "School Work and Play," and recommended that something similar should be done in order to popularise entomology. He said that specimens were first photographed upon zinc plates instead of glass, and, in

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this way, by a special process, blocks were prepared for the printer at a very trifling expense. The project was heartly approved of, and it was agreed on all sides that much valuable instruction might be disseminated in this way.

Mr. Burman related his experience of injury to cattle and dogs by flies in the Northwest, and asked whether fish-oil would be a remedy. In reply, Mr. Fletcher and Mr. Howard stated that fish and other oils and grease were effective, both in keeping off the flies and in healing the affected parts.

The meeting then adjourned till the afternoon.

AFTERNOON SESSION.

The report of the council, the audited financial statement of the Secretary-Treasurer, and the report of the Librarian were presented and read to the meeting, and, on motion, were duly discussed and adopted. Mr. Moffat spoke of the large amount of work and the great care which Mr. Reed had bestowed upon the library during many years past, and of the excellent position into which it was now brought. He moved that "The thanks of the Society be given to Mr. Reed for his services in the library, and that the Executive Committee be hereby recommended to consider the possibility of shewing, in some pecuniary way, their recognition of his labors." Mr. Geddes, in seconding the resolution, which was duly carried, referred in warm terms to Mr. Reed's efficiency and kindness in connection with the library. It was suggested, in the discussion that followed, that a catalogue of the books should be prepared, and that by-laws should be framed for the proper regulation of the library and the issue of books to members of the Society. Mr. Denton said that there were now about eleven hundred volumes in the library, many of them being very rare works on entomology and other departments of science; he thought it most desirable that members out of London should be enabled to know what books there were, and under what conditions they might borrow them. Dr. Brodie spoke of the great importance of having a complete catalogue made of all the libraries in Ontario, and said that he considered it a work that might very well be undertaken by the Provincial Government. Mr. Reed thought that we were still in too crude a state to publish a catalogue of the Society's Library, but we might

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make a beginning by issuing lists of the books in its different departments. It was finally agreed to leave the matter in the hands of the Librarian.

Mr. Lyman read his report as delegate to the Royal Society of Canada. Mr. Reed, in reply to an enquiry, gave an account of what had been done during the past year with regard to the Society's rooms and collections; he stated that they had frequently been opened to the public, and that many very pleasant evenings had been spent among the microscopes, books and cabinets.

Mr. Reed drew the attention of the meeting to the changes in "The Agricultural and Arts Act," affecting the Society, made during the last session of the Ontario Legislature, and moved, seconded by Dr. Bethune, "That in accordance with the provisions of section 67 of the Agricultural and Arts Act, as amended in 1889, the agricultural divisions in Schedule A of the said Act be grouped into the following five divisions, for the purpose of electing one person from each of said five divisions (who shall be a resident of the district he represents) as directors of the Entomological Society of Ontario:—

Division	1,	to comprise	Agricultural	Divisions	1, 2, 3.
"	2,	"	"	"	4, 5, 13.
"	3,	"	"	"	6, 10.
"	4,	"	"	"	7, 8, 9.
"	5,	"	"	"	11, 12.

And that this grouping of the Divisions be in force until otherwise altered or re-arranged at any annual meeting of the Society."—*Carried.*

The following gentlemen were elected officers for the ensuing year:—

President—Rev. C. J. S. Bethune, M. A., D. C. L., Port Hope.
Vice-President—E. Baynes Reed, London.
Secretary-Treasurer—W. E. Saunders, London.
Librarian—E. Baynes Reed, London.
Curator—Rowland Hill, London.
Directors—Division 1—W. H. Harrington, Ottawa.
" 2—J. D. Evans, Sudbury.
" 3—Gamble Geddes, Toronto.
" 4—J. Alston Moffat, Hamilton.
" 5—J. M. Denton, London.

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Editor of the CANADIAN ENTOMOLOGIST—Rev. Dr. Bethune, Port Hope.

Editing Committee—James Fletcher, Ottawa; J. M. Denton, London; Rev. T. W. Fyles, Quebec; Dr. Brodie, Toronto.

Delegate to the Royal Society of Canada.—H. H. Lyman, Montreal.

Auditors—J. M. Denton and E. B. Reed.

Mr. Moffat, who had been engaged for some time past in re-arranging the Society's collections, spoke of the desirability of printing a new list of Lepidoptera for labelling purposes. Dr. Bethune said that he did not think it advisable to do so just now, as the nomenclature of the order must be considered to be in a somewhat transition state; he thought that after Mr. Scudder's magnificient work on the butterflies was completed, and students had time to master its contents, there would be a very general adoption of many, at any rate, of his generic titles, and that this would alter very much our current nomenclature. He also referred to Prof. J. B. Smith's contemplated monograph of the Noctuidæ, the frequent descriptions of new species by Mr. Hulst and others, and the work of Prof. Fernald among the Micros, as rendering the publication of a list premature at present. He said that he had in his possession a new check-list of the Noctuidæ by Mr. Grote, but its publication was deemed unwise owing to the foregoing considerations. He thought that Mr. Moffat's object could be met by printing a few sheets to supplement the lists published a few years ago by Dr. Brodie and Dr. White.

Papers were then read by (1) Dr. Brodie, on "Gall Insects;" (2) the Rev. T. W. Fyles, "Some notes on the Effects of Heat on Insect Life;" (3) Dr. Goding, "In Memoriam: George John Bowles." These papers will be published in full in the Annual Report.

The Rev. W. A. Burman, of Winnipeg, was elected a member.

After spending some time in the examination and discussion of various specimens brought by members, the meeting adjourned to meet in London next year.

ERRATUM.—In the description of the larva of *Grapta j-album*, by Mr. P. M. Dawson, in the September number, there occurs the obvious mistake (page 180, line 12) of "eight inches long" instead of ".8 inch."

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A NEW CLOTHES BEETLE.

BY PROF. A. J. COOK, AGRICULTURAL COLLEGE, MICHIGAN.

One of the most interesting studies of the scientific entomologist—more interesting because of its economic importance—relates to variation of habits of insects, consequent upon variation in their environment. The carpet beetle, *Anthrenus scrophulariæ* Linn., feeds on flowers in its native Europe. In the new atmosphere of America, it feeds and thrives upon carpets, shawls and other woollen goods. The apple maggot, *Trypeta pomonella*, feeds upon our wild haw and other wild fruits. Civilization exterminates its old-time aliment; and it betakes itself to our apples, cherries and plums. The curculio, apple-tree borers, bark lice, etc., are other illustrations of the same truth.

In the past season I have discovered another illustration in the *Lasioderma serricorne* Fab. This insect belongs to the family *Ptinidæ*, a small family of very small insects. Very few of the insects of this family are noxious; the two best known of which are, the apple-tree twig borer, *Amphicerus bicaudatus* Say., which bores in the mature state in the twigs of the apple, and *Linoxylon basilare* Say, which attacks the hickory and grape. The insect in question, *Lasioderma serricorne* Fab., has been found to attack plush furniture. The larvæ, in this case, do the mischief; they perforate the plush, making it like a sieve. I know of several pieces of upholstered furniture utterly ruined by these minute larvæ.

The beetle is light-brown in color. There is little variation in the color, except that the eyes and tips of the elytra are black. The wing-covers appear a little lighter, because of a covering of light hairs, which are more dense on the elytra than on the thorax and head. The thorax bends down, so that, as we look from above, we can not see the head. The serrate antennæ, which give its name to the beetle, are also bent under the head, so as to rarely show. The beetle is very small, hardly more than 2 m.m. long. The elytra are non-striated. The first two joints of the antennæ are small. They then increase to the sixth, and then decrease to the end. The tenth, or last joint, is rounded. The grubs are short, curled and hairy. They are two m.m. long and one thick. The color is white, and the hairs nearly white. These latter have a slightly yellowish tinge. The six thoracic legs are tipped with black. The upper part of the head shows four yellowish-brown lines. The upper ones are

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narrowest, while the lateral ones are abbreviated behind. The front of the head is brown, while the jaws and other mouth parts are nearly black.

Like all insects, these beetles, both as larvæ and imago, are very susceptible to gasoline or bi-sulphide of carbon. Both of these, used in large quantities, were quickly fatal to the insects. Like the carpet beetle, they infest upholstered furniture between the folds, especially where the back joins the seat. It is easy to drench such parts of a sofa or chair with gasoline and destroy the larvæ of either moth or beetle.

Nearly every year brings examples of such change of habits as described above. Such incursions, present and prospective, emphasize the importance of thoroughly-trained entomologists in every state of our country.

THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA.

(Third Paper.)

BY A R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Agrotini.*

The tibiæ are usually all spinose, the eyes naked, the body untufted, the form normal, the male antennæ of various structure, pectinated, brush-like, simple. The European species are referred by Lederer all to one genus, *Agrotis* of Hübner. Nevertheless, I think the yellow-winged forms may well be separated under *Hiria* and *Tryphæna.* Of these yellow-winged forms, with flattened abdomen, we have only one *T. Chardinyi,* from Anticosti and Maine, considered identical with the Siberian species of the same name, described originally by Boisduval under *Anarta.* For the structure of *Agrotis,* I refer the student to a paper of mine on the genus, CAN. ENT., XV., 51. This genus seems of general distribution, although, perhaps, most numerously represented by species in North America. To this tribe, I would refer certain American genera, with few species, which seem peculiar. These are: *Carneades,* which differs by a frontal tubercle; *Richia,* which resembles *Ammoconia* in having a thoracic rigid tuft, but has simple antennæ; *Adita,* with a claw on front tibiæ; *Agrotiphila,* with narrowed eyes; *Anytus,* with lashes; the peculiar genus *Ufeus,* and, finally, *Copablepharon,* which has some

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resemblances to the *Heliothians*, and superficially recalls *Arsilonche*. The position of some of these genera is debatable, and the immature stages almost entirely unknown. We may briefly compare the European and American representatives of *Agrotis*. In Europe, about 120 species are known; we have a preliminary list of over 200. Divisions of the genus into groups have been proposed on peculiarities of the genitalia, which seem convenient, but are probably of less importance than the armature; hence, I would prefer to divide the genus, primarily, into two groups, the species with unarmed fore-tibiæ, and those with all the tibiæ armed. When all the species are compared, there will probably be found peculiarities in the armature of the front tibiæ to warrant further divisions. The relationship of the American species to the European is evidenced by the identical forms, *i. e.*, *baja*, *ypsilon*, *plecta*, *sancia*, etc., then by the representative forms, *i. e. haruspica*, *phyllophora*, etc. The species from the west coast have largely a European facies; the Labrador species are found, with other Arctic forms, on the summit of Mount Washington. We may regard this genus as of very general, pre-glacial distribution; but evidently a greater number of species feed, in the larval condition, upon plants now found in temperate latitudes. Setting the question of the allied genera with mostly few species aside, the affinity of the two faunæ is quite evident. It is a little singular that the yellow-winged forms are so feebly represented in North America. Their presence gives a somewhat peculiar aspect to the European fauna. The occurrence of yellow-winged species is not unusual in the *Noctuidæ*. We find them in *Oncocnemis*, *Hadena* and *Anarta* among usually fuscous species.

Tribe *Hadenini*.

Leaving the *Dicopid* genera, which seem peculiar, we now come to a group of typical Owlet moths, which differ from the *Agrotini* mainly in their usually unarmed tibiæ and tufted, rougher, body covering. In the first genera, the eyes are hairy; in *Fishia*, the tibiæ are spinose; in *Copimamestra*, the front tibiæ have a claw. This latter genus is founded for the European *brassicæ* and its American representative *occidenta*. *Mamestra* is a typical Hadenoid genus with hairy eyes, and *Dianthœcia* merely differs by the external ovipositor. These two genera, or generic groups in our fauna, show a similar relation to the European fauna as with *Agrotis*. Whether our *trifolii (albifusa)* is identical with the European, may not be certain, but the genus has several representative species

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such as *nimbosa*, *atlantica*, *subjuncta*, etc. In *Dianthœcia*, we have *D. bella*, which represents the European *D. Magnolii*. America has the usual preponderance of species, over seventy, while Europe has fifty-eight of the two together. In my lists I have not separated the forms of *Dianthœcia*, partly because the character was not easy to verify, or I had only males, while the pupa, which presents some peculiarities as studied in Europe, is quite unknown. Peculiar American Hadenoid genera, with hairy eyes, seem to be *Nephelodes*, *Admetovis*, *Tricholita*, *Trichoclea*, *Trichopolia* and *Eupsephopœctes*.

I would here draw attention to the fact, that the generic characters in the *Noctuidæ* and the moths generally are of such a nature that a difference of opinion may legitimately arise. Undoubtedly, an ultimate and better opinion may be obtained, but criticism is to be only indulged in with that moderation which the nature of the subject demands. Far different is it with matters concerning positive or actual structure, where the empiric has before him a certain specimen under the microscope. In such cases, as with the genus *Cerathosia*, where the describer erroneously describes the neuration or other actual features, a positive error is committed and the author earns that measure of opprobrium which belongs to defective work in Natural History.

The European Hadenoid genera, with naked and lashed eyes, *Episema*. *Thecophora* and *Dichonia* seem to be absent from our fauna. *Polia*, which has the antennæ tufted at base and usually pectinate or serrated in the males, has eleven European species; in the Bull. U. S. Geol. Surv, VI., 266, I have given the list of ten American forms referred here, whether they are all strictly correct, I am uncertain. The European genera, with few species, *Metopoceras*, *Cladocera*, *Heliophobus*, *Ulochlæna*, *Oxytrypia*, are yet without described American species. Guenèe's *Chariptera festa* seems to be the *Cerma cora* of Hübner, and not to be congeneric with the European *viridana*. Mr. Morrison's *Valeria Grotei* has a claw on the fore tibiæ; consequently is not congeneric with the European *jaspidea*, but seems to be allied to *Dicopis*.

The genus *Oncocnemis* is a smooth, almost Agrotid form, considered by Herrich-Schaeffer as allied to *Heliothis* with a claw on the front tibiæ, represented by two Russian species, of which *confusa* has a representative form in the Californian *Behrensi*. I have described the large number of nineteen American species (three having yellow secondaries, *Hayesi*,

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Dayi and *mirificalis)*, while other authors have added four; our most beautiful Eastern form being the *atrifasciata* of Mr. Morrison, which I refer to this genus, it being related apparently to the grey forms, such as *Chandleri*, *riparia*, etc., the median space filled with black. I refer two Western species to the European genus *Valeria*, *opina* and *conserta*, and one Eastern species, *stigmata*, to the European genus *Dryobota*. Peculiar American Hadenoid genera, with naked eyes, seem to be *Arthrochlora*, *Hillia*, *Homohadena*, *Pachypolia* and *Hadenella*. The typical genus, *Hadena* itself,seems to have a parallel representation in North America with the other leading genera *Apatela*, *Agrotis* and *Mamestra*, from which latter genus the species differ in having naked eyes. It offers both identical and representative species with the European forms, and again an excess in number, over sixty to over forty. The related genus *Hyppa* with its one European species has a representative American form *xylinoides*. I have identified the European *Dipterygia pinastri* as occurring in North America; whether this is a survival, or a more recent importation, is doubtful, perhaps the latter. Of the European genus *Actinotia*, we have two species; of *Callopistria*, one. A strong analogy of the two faunæ is offered by the genera clustering about *Euplexia*, the single species of which latter, *lucipara*, is found from the East to California, and is apparently an unchanged survival and identical with the European; I have found the larvæ on a number of plants, among them the common *Fuchsia*. These genera are *Trigonophora*, and *Brotolomia*, each with representative American forms, while the European genus *Habryntis* is perhaps not found in America, nor, conversely, the American genus *Conservula* in Europe. *Prodenia*, which has one European, has at least four North American species. This genus is a Southern form, intruding into the European fauna from the Mediterranean and Asia Minor; in America, more plentiful in the Southern States, where an allied form, the *Laphygma frugiperda* of Abbot and Smith, is destructive to corn. We have nothing like the wide-winged European *Mania maura*, so far as my knowledge goes. The determination of what species is the real type of the earlier genera of Ochsenheimer and other authors is a matter of some difficulty, owing to the fact that the species were loosely associated, and the characters we today consider of importance neglected. Not a single species included by Boisduval in 1829 under *Luperina* is placed under *Luperina* by Lederer. The true type of *Luperina* may, I think, be considered to be the Euro-

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pean *testacea*, which Lederer includes under *Apamea* Tr. Probably the true type of *Apamea* may be found in *nictitans*, one of the original species.

Of neither *Luperina* Boisd. (= *Apamea* Led.), or *Ledereria m.* (= *Luperina* Led. non Boisd.), do I know American species. *Apamea nictitans* occurs with us however, from California to the East probably as an unchanged survival, not only in the typical, but also in the varietal European forms. Whether *nictitans* and certain allied species are distinct from *Gortyna*, I, however, doubt, and it is probable that we have but one genus which European authors call *Hydrœcia* Guen. Now the type of *Hydrœcia* is *micacea*, as cited in the Species Gèneral. But the type of *Gortyna* is already designated by Hübner as *micacea*, consequently *Hydrœcia* must fall. For *Gortyna* Led., with its one species *flavago*, which differs from *Hydrœcia* by its mucronate clypeus, the term *Ochria* must be used, as I have pointed out. The objectors to Hübner must be told that Ochsenheimer cites him as authority, himself giving no diagnoses to the Noctuid genera ; that the older Noctuid generic names are all incompletely founded, that there is no standard for exact generic definition, and finally, that Hübner has given us more information and a better classification for the *Noctuidæ* than any author before his time. Hübner separates the *Thyatirinæ* correctly for the first time ; he is the author of the leading generic divisions and names, *Apatela*, *Agrotis*, *Heliothis*, etc., names which have been wrongly credited to his successors. The North American species of *Gortyna* (including those separated by me with *nictitans)* are much more numerous than the European. The finest species is our beautiful *Gortyna speciosissima.* We have two species with mucronate clypeus ; one from the East, *buffaloensis*, and another from the West. In ornamentation these species resemble the other *Gortynæ*, but we must refer them to *Ochria*, together with the European *flavago*. Our North American species which most nearly resembles the European *flavago*, is, however, my *Cataphracta*, but here the front is smooth. The question then arises as to the value of the frontal tubercle ; whether it may not be developed as easily as modifications in the color or pattern of ornamentation. Such questions are beyond our present ability to answer. We must use what characters we find upon which to found our genera, but the difficulties which the subject presents should preclude all notion that our present opinions are infallible, or that we have any reasonable pretext to arrogate to ourselves a superiority in our classi-

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fication which allows us to speak unduly and depreciatingly of those who studied these matters long ago.

As with former groups, the North American *Hadenini* show a prevailing affinity with the European fauna. The amount of divergence can hardly be shown until all the species are carefully compared, but we can be sure it will not outweigh the resemblance.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 175.)

Sub-Family ARCTIINÆ.

In the previous paper I explained the sense in which this term is used, and nothing further in the way of definition need be said on that head.

Genus CROCOTA Hbn.

1816—*Verzeichniss;* Samml., Eur. Schm., III., 254.

This genus is in a sad state. It is almost impossible to identify species satisfactorily, and yet new species are constantly described. The matter has been further confused by Mr. Grote's persistent refusal to refer to Mr. Reakirt's species, for without referring them positively as synonyms to any species, he says he cannot believe that they refer to species different from those recognized by him, and therefore he ignores them altogether. This has had the effect of causing others to lose track of the descriptions which, poor as they may be, yet are necessary to be referred to. We know nothing at all as yet as to the range of variation in the genus, and species are based upon the most indefinite comparative features of colour and appearance.

Using *C. ferruginosa* as subject: The head is free, rather small; eyes large, somewhat prominent; ocelli distinct; vestiture scaly, smooth; antennæ of male with the joints marked, scarcely serrate, with fine lateral ciliæ, palpi moderate in length, straight or slightly drooping. Thoracic vestiture scaly. Legs closely scaled, posterior longest, the spurs normal —*i. e.*, middle with one, posterior with two pairs. The tongue is rather short, but corneous and spiral. Wings proportionately wide and short,

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rather frail and thinly scaled, usually some shade of reddish or yellowish, more rarely tending to black. On the primaries, veins 7 to 10 inclusive are on a stalk out of the end of the cell, 10 thus not arising out of the subcostal, 3, 4 and 5 are almost equidistant from the end of the median. On the secondaries, 3 and 4 are from the end of the cell, 5 is wanting, 6 and 7 from a stalk out of the end of the subcostal, 8 from subcostal, about one-third from base. There may be some variation in the origin of 2, 6 and 7 of secondaries, and 5 may be present in some species; these are variable points in this family.

From what I have seen, I believe that almost any good local collection would show most of the species; in other words, I believe individual characters have been largely used for specific distinction.

C. aurantiaca Hbn.

1825—Hübner, Zutr., p. 9, ff. 411, 412, *Eubaphe.*
1855—Wlk., C. B. Mus. Lep. Het., II., 523, *Eubaphe.*
1862—Morris, Synopsis, 253, *Eubaphe.*
1864—Pack., Proc. Ent. Soc., Phil., III., 103, *Crocota.*
Habitat—"Georgia." Eastern and Middle States.

Packard apparently did not recognize this species. I am not sure that I have it correctly, but what I take to be the species seems to occur east of the Mississippi and north of the Carolinas.

C. belfragei Stretch.

1885—Stretch, Ent. Amer., I., 103, *Crocota.*
Habitat—Texas.

C. brevicornis Wlk.

1855—Wlk., C. B. Mus. Lep. Het., II., 536, *Crocota.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 542, *Crocota.*
1862—Morris, Synopsis, 255, *Crocota.*
1862—Clem. in App. to Morris' Syn., 308, *Crocota.*
1864—Pack., Proc. Ent. Soc., Phil., III., 104 *Crocota.*
1877—Butl., Tr. Ent. Soc., Lond., 367, *Eubaphe.*
Habitat—Can., Maine, N. Y., Mass., Ohio, Ills., Colo.

Apparently quite widely distributed. Butler says Walker had several specimens of this species among his *rubicundaria.*

C. costata Stretch.

1885—Str., Ent. Amer., I., 103, *Crocota.*
Habitat—Texas.

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Apparently a very distinct species, which I have identified in the National Museum collection.

C. diminutiva Graef.

1887—Graef, Ent. Amer., III., 42, *Crocota.*
Habitat—Texas.

C. ferruginosa Walker.

1855—Walk.,* C. B. Mus. Lep. Het., II., 535, *Crocota.*
1860—Clem., Proc. Ac. N. Sci., Phil,, XII., 542, *Crocota.*
1862—Morris, Synopsis, 255, *Crocota.*
1862—Clem., in Morris Syn., App., 308, *Crocota.*
1864—Pack., Proc. Ent. Soc., Phil., III., 103, *Crocota.*
1867—Grt., Proc. Ent. Soc., Phil., VI., 313, *Crocota.*
1868—Bethune, CAN. ENT., I., 18, *Crocota.*
1877—Butl., Tr. Ent. Soc., Lond., 367, *Eubaphe.*
aurantiaca ‡ Harris.
1850—Harris in Ag. Lake Super., 393, *Eubaphe.*
1864—Pack., Proc. Ent. Soc., Phil., III., 103, pr. syn.
rubicundaria ‡ Walker.
1855—Wlk., C. B. Mus., Lep. Het , II., 536, *Crocota.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. syn.
Habitat—Canada to N. Y., west to the Mississippi, Lake Superior, H. B. Terr., Maine.

The distribution is probably wider. It is quite uncertain what this species really is, and authors are not agreed. Butler says one specimen of Walker's *rubicundaria* is referable here.

C. fragilis Strk.

1879—Rept. Engin., 1878-79, V., p. 1859, *Crocota.*
Habitat—" Pagosa Springs," July 21.

This is almost certainly *Ameria unicolor*, if Mr. Strecker's description is good for anything.

C. immaculata Reak.

1864—Reak., Proc. Ent. Soc., Phil., II., 372, *Crocota.*
Habitat—Philadelphia, Pa.

* This sign, whenever used with a reference, as above, indicates that the early stages were referred to.

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So far as I know this species has not been positively identified with any other.

C. intermedia Graef.

1887—Graef, Ent. Amer., III., 42, *Crocota.*

Habitat—Texas.

C. læta Bdv.

1829—Bdv. in Guer. Icon. Ins., pl. 88, f. 6, p. 519, *Lithosia.*

1855—Walker, C. B. Mus. Lep. Het., II., 537, *Crocota.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 537, *Crocota.*

1862—Clem. in App. to Morris, Syn., 309, *Crocota.*

1864—Pack., Proc. Ent. Soc, Phil., III., 105, =*brevicornis.*

1877—Butl., Tr. Ent. Soc., Lond., 367, *Eubaphe.*

treatii Grote.

1865—Grt., Proc. Ent. Soc., Phil., IV., 322.

1882—Grt., New List 15, ? =*treatii.*

Habitat—Mass., N. Y., N. J., D. C.

I have in some way mislaid my notes on the figure in Griffith's Cuvier; that in Guerin I have never seen. My recollection is that the figure is on the same plate with that of *Callimorpha Lecontei* (pl. 32), and is the lower figure on the plate. I never had any doubt of its being the species afterward called *treatii* by Mr. Grote. Dr. Packard had evidently not seen this species when he hazarded the suggestion that this might be the same as Walker's *brevicornis.*

C. nigricans Reakirt.

1864—Reak., Proc. Ent. Soc., Phil., II., 371, *Crocota.*

Habitat—Philadelphia, Pa.

Unknown to me.

C. obscura Stretch.

1885—Stretch, Ent. Amer., I., 103, *Crocota.*

Habitat—N. H., Pa.

C. opella Grote.

1863—Grt., Proc. Ent. Soc., Phil., I., 345, *Crocota.*

1863—Grt., Proc. Ent. Soc., Phil., II., 30, pl. 2, f. 1.

1867—Grt., Proc. Ent. Soc, Phil., VI., 313, *Crocota.*

1877—Butl., Tr. Ent. Soc., Lond., 367, *Eubaphe.*

Habitat—Pa, N. Y., Can.

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Butler says Walker included specimens of this species with his *rubicundaria*.

C. opelloides Graef.

1887—Graef, Ent., Amer., III., 42, *Crocota*.

Habitat—Texas.

C. ostenta Hy. Edwards.

1881—Edw., Papilio, I., 12, *Crocota*.

Habitat—Arizona.

C. quinaria Grote.

1863—Grt., Proc. Ent. Soc., Phil., II., 30, pl. 2, f. 2, ♀, *Crocota*.

1864—Pack., Proc. Ent. Soc., Phil., III., 105, *Crocota*.

1867—Grt., Proc. Ent. Soc., Phil., VI., 313, *Crocota*.

choriona Reakirt.

1864—Reak., Proc. Ent. Soc., Phil, II., 371, *Crocota*.

1864—Pack., Proc. Ent. Soc., Phil., III., 105, ? pr. syn.

1865—Grt., Proc. Ent. Soc., Phil., V., 234, pr. syn.

bimaculata Saunders.

1869—Saund., CAN. ENT., II., 51, *Arctia*.

1882—Grt., New List, pr. syn.

Habitat—Mass., Can., Pa., Colo. "8,000 ft."

C. rubicundaria Hübner.

1825—Hbn., Zutr., p. 28, 256, ff. 511, 512, *Crocota*.

1855—Walk., C. B. Mus. Lep. Het., II., 536, *Crocota*.

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 541, *Crocota*.

1862—Morris, Synopsis, 256, *Crocota*.

1862—Clem., App. to Morris Syn., 307, = *Phrag. rubicosa*.

1866—H.-Schaeff, Corr. Blatt, XX., 118, ?, = *aurantiaca*.

1867—Grt., Proc. Ent. Soc., Phil., VI., 313, *Crocota*.

1868—Bethune, CAN. ENT., I., 18, *Crocota*.

1877—Butler, Tr. Ent. Soc., Lond., 367, *Eubaphe*.

Habitat—Can., Mass., N. Y., Ga., Ills.

According to Butler, the *rubicundaria* of Walker is not Hübner's species, but seems a mixture of at least three other species.

Genus EMYDIA Boisd.

1829—Boisd., Ind., Meth.

This genus I know only in the European species, and from descrip-

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tions by European authors. In appearance it is Lithosii-form, with rather narrow primaries and broad secondaries; the vestiture is close, smooth; vein 5 of secondaries is said to be wanting; fore-tibia unarmed; the spurs of middle and hind tibia normal. I do not remember the venation of primaries, and made no note as to the origin of vein 10.

E. ampla Grote.

1878—Grt., CAN. ENT., X., 232, *Emydia.*
Habitat—Colorado.

Genus UTETHEISA Hübner.

1816—Hübn., Verzeichniss, 168.

A well marked genus containing very handsome and extremely variable species, since it has been determined that all our forms are but varieties of one species. The head is distinct, free, eyes rather large, not prominent, ocelli distinct. The palpi are slender, ascending, reaching the middle of front, the terminal joint rather long, closely scaled. Antennæ moderately long, slender, simple in the ♀, in the ♂ the joints marked with single lateral bristles. Legs closely scaled, quite considerably longer posteriorly, all the spurs complete and moderate in length. Body closely scaled. Primaries with vein 10 out of the subcostal, a short cross vein connecting it with the stalk bearing 7, 8 and 9, and thus forming an accessory cell; 6 is from the end of the sub-costal; 4 and 5 are close together out of the end of the median; 3 somewhat remote from 4, but much nearer than to 6. Secondaries with 3, 4 and 5 very close together from the end of the median; 6 and 7 together from the end of the sub-costal; 8 as usual about one-third from base out of the subcostal. Both *Crocota* and *Emydia* lack vein 5 of secondaries, which is a decided *Lithosiid* tendency; *Utetheisa* has 5 well marked, and has a distinct accessory cell, the relation to *Callimorpha* being obvious in the entire scheme of venation.

As the species are attractive as well as variable, the literature is voluminous, and yet I have given none of the "popular" or economic references.

N. bella Linne.

1758—Linn., Syst. Nat. Ed., X., 534, *Tinea.*
1767—Linn., Syst. Nat. Ed., XII., 885, *Tinea.*

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1764—Linn., Mus. L. U., 399, *Tinea.*
1770—Drury, Exot., I., 51, pl. XXIV., f. 3, *Tinea.*
1775—Fabr., Syst. Ent., 585, *Bombyx.*
1781—Fabr., Sp. Int., II., 203, *Bombyx.*
1787—Fabr., Mant. Ins., II., 131, *Bombyx.*
1791—Oliv., Encycl. Meth., V., 99, pl. 72, f. 10, *Bombyx.*
1793—Fabr., Ent. Syst., III,, p. 479, *Bombyx.*
1793—Gmel., Ed. Linn. Syst. Nat., 2447, *Bombyx.*
1816—Hübner, Verzeichniss, 168, *Utetheisa.*
1837—Westwood, Ed. Drury, I., 46, *Deiopeia.*
1841—Harris, Rept. Ins., Mass., *Deiopeia.*
1841—Duncan, Nat. Libr., XXXII., 191, pl. 24, f. 1, *Deiopeia.*
1855—Wlk., C. B. Mus. Lep. Het., III., 568, *Deiopeia.*
1862—Morris, Synopsis, Supplt., 251, 313, *Deiopeia.*
1862—Harris, Inj. Ins. Flint Ed., 342, pl. VI., f, 2, *Deiopeia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 105, *Utetheisa.*
1865—Grt., Proc. Ent. Soc., Phil., V., 234, *Utetheisa.*
1866—H.-Schaeff, Corr. Blatt, XX., 119, *Callimorpha.*
1869—Bethune, CAN. ENT., I., 18, *Utetheisa.*
1873—Stretch*, Zyg. & Bomb., 56, 236, pl. 2, f. 15, *Utetheisa.*
1875—Saund,, CAN. ENT., VII., 85, f. 1, *Deiopeia.*
1877—Butler, Trans. Ent. Soc., Lond, 361, *Deiopeia.*
1879—Hulst., Bull. Bkln. Ent. Soc., I., 83, *Deiopeia.*
1883—Edw.* Papilio, III.. 128, *Utetheisa.*
1886—Moeschl., Ent. Amer., II., 75, *Utetheisa.*
1887—Gundlach, Cont. Ent. Cuba, 257, *Utetheisa.*
var hybrida Butler (between *bella* and *ornatrix*).
1877—Butl., Trans. Ent. Soc., Lond., 361, *Deiopeia.*
var. *ornatrix* Linn.
1758—Linn., Syst. Nat. Ed., X., 511, *Noctua.*
1767—Linn., Syst. Nat. Ed., XII., 839, *Noctua.*
1764—Linn., Mus. L. U., 384, *Noctua.*
1770—Drury, Exot., I., 51, pl. 24, f. 2, *Noctua.*
1775—Fabr., Syst. Ent., 586, *Bombyx.*
1779—Cram., Pap. Exot., II., 107, 108, pl. 161, ff. C, D, F, *Phalaena.*
1781—Fabr., Sp. Ins., II., 203, *Bombyx.*
1787—Fabr., Mant. Ins., II., 131, *Bombyx.*

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1791—Oliv., Enc. Meth., V., 100, *Bombyx.*
1793—Fabr., Ent. Syst., III., 1, 479, *Bombyx.*
1816—Hbn., Verzeichniss, 168, *Utetheisa.*
1820—Hbn., Samml. Ex. Schmett., II., pl. 394. *Utetheisa.*
1837—Westw., Ed. Dru., I., 46, pl. 24, f. 2, *Deiopeia.*
1855—Walker, C. B. Mus. Lep. Het., III., 567, *Deiopeia.*
1856—Lucas in Sagra's Cuba, 301, *Deiopeia.*
1865—Grt., Proc. Ent. Soc., Phil., V., 234, pr. var.
1873—Stretch, Zyg. & Bomb., 58, pl. 2, f. 18, *Utetheisa.*
1877—Butler, Trans. Ent. Soc., Lond., 361, *Deiopeia.*
1886—Moeschl., Ent. Amer., II., 75, *Utetheisa.*
var *intermedia* Butler (between *bella* and *speciosa*).
1877—Butl., Tr. Ent. Soc., Lond., 361, *Deiopeia.*
var *speciosa* Walk.
1855—Wlk., C. B. Mus. Lep. Het., III., 568, *Deiopeia.*
1862—Morris, Synopsis Supplt., 314, *Deiopeia.*
1865—Grt., Proc. Ent. Soc., Phil., V., 234, pr. var.
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. var.
1873—Stretch, Zyg. & Bomb., 57, pl. 2, f. 16, *Utetheisa.*
1877—Butl., Tr. Ent. Soc., Lond., *Deiopeia.*
1886—Moeschl., Ent. Amer., II., 75, *Utetheisa.*
bella ‡ Cram.
1779—Cram., Pap. Ex., III., 20, pl. 109, ff. C and D, *Phalaena.*
1886—Moeschl., Ent. Amer., II., 75, = *speciosa.*
Habitat—Can. to D. C., Ga., west to Miss., Ia,, Mo., for *bella* varying to *ornatrix* in Tex., Mex., Fla., West Indies, where also *speciosa* occurs.
Recorded food plants are *Crotelaria, Lupin, Prunus, Lepedeza, Ulmus.*

Few species have greater bibliography, and, as already hinted, it is far from complete.

Mr. Butler's paper in the Trans. Ent. Soc., London, for 1877, seems to have been lost sight of. Mr. Grote does not quote his varieties in his "New List," nor does Mr. Hy. Edwards, in his additions, Ento. Amer., March, 1888, refer to them.

(To be continued.)

Mailed October 4th.

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The Canadian Entomologist.

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POPULAR AND ECONOMIC ENTOMOLOGY—No. 5.

THE TIGER-SWALLOW-TAIL *(Papilio Turnus, L.)*

BY JAMES FLETCHER, OTTAWA.

Just about the time the lilac bushes open their fragrant blossoms the grand insect shown at figure 9 may be seen either hovering over gardens and sipping the nectar of flowers, or sailing majestically down some woodland glade. It generally appears at Ottawa about the first of June,

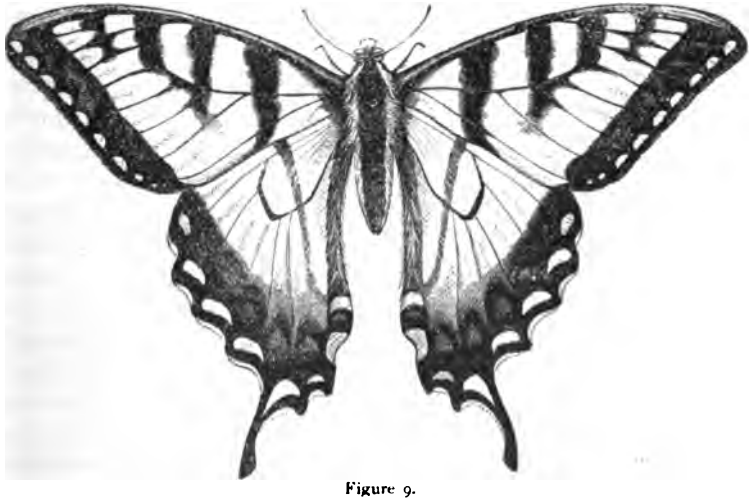

Figure 9.

and may be seen for a month or more. Farther to the north it comes later, not appearing at Nepigon, north of Lake Superior, until the end of June. This insect has many characters which make it of interest to the collector. Its size and beauty make it a striking object in the spring landscape. Although it varies in abundance in different years, it is generally one of the first treasures of the young collector, and is prized accordingly. The variations it presents in different latitudes and the habits of its remark-

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able caterpillar are of great interest to the student. In the north, including the whole of Canada, the males and females are like our figure, having the ground colour of a pale lemon yellow, with rich black markings. The broad margin is more or less powdered with blue scales, particularly on the hind wings, which are further ornamented with a conspicuous orange-red spot, bordered with black and blue, near the hind angle, and in the females there is another large spot of the same colour at the upper angle. In the Southern States the specimens of both sexes are larger and more highly coloured, and besides a black dimorphic form of the female also occurs. No specimen of a black male has ever been taken. The only approach to this melanic form is the beautiful suffused variety which is figured below. The range of the Tiger-Swallow-tail is very extended. I have some specimens from the arctic circle and others from the tropics, while from east to west it occurs from Newfoundland to Alaska. The eggs are laid by the females singly on the upper side of the leaves of its food plants. They are about one-twentieth of an inch in diameter, sub-globular and smooth, at first of a pale transparent green, much yellower at the base by reason of a more or less abundant waxy substance which fastened them to the leaf; after a few days they turn reddish, and just before the young larvæ hatch they are almost black. The time of hatching varies with the weather from ten to twenty days. The caterpillars are very different in appearance during their various stages. In the first stage the general appearance is black, with white spots and tubercles, and a conspicuous white saddle-shaped mark on the back. This mark also appears after the first and second moults, but is then of a pinkish cream colour. After the second moult the ground colour of the body usually changes to greenish brown. After the third moult the green colour is much more decided, and the caterpillar assumes more of the shape and markings of the full-fed larva. The thoracic segments are now enlarged and the saddle-shaped mark is almost obliterated. There is a yellowish band in front of segment 2, and another on the hinder edges of segments 5 and 12; that on 5 is followed closely by a black line on the front edge of segment 6. This black line does not show when the caterpillar is at rest. The head is pink brown. On each side of segment 4 now appears a pear-shaped yellow eye-like spot, the larger end outwards. This spot is edged by a fine black line; inside there is a heavy black line enclosing a violet spot.

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Towards the smaller end of this yellow spot is a short black bar. The sides of the body are also ornamented with rows of violet spots, two upon segment 4, and four upon 5, 8, 9, 10 and 11, and two upon 12. On segments 6 to 11 there is one small spot below each spiracle. These spots are more distinct upon some specimens than upon others.

After the fourth or last moult the colour is invariably velvety green, paler beneath, the saddle-shaped mark has disappeared and the yellow marks are all more conspicuous. The full-grown caterpillar is shown at figure 10, and is a formidable looking creature. For two days before it suspends itself to change to the chrysalis, it gradually assumes a purplish brown tint, and the violet spots become more distinct than they were before. The full-grown larva is about one inch and a-half in length when walking. When at rest it is shorter and thicker, the head is drawn in out of sight and the body assumes a wedge shape, large in front, tapering rapidly to the last segment. When in this position the yellow spots on segment 4 have the appearance of two large open eyes. This appearance may possibly act as a protection from some of its enemies. When ready to turn to a chrysalis, it leaves its food-plant and seeks some place to pupate. It suspends itself to a silken mat and supports its body by means of a silken girdle around the middle. It changes to a chrysalis the second day after suspension. The newly formed chrysalis is very beautiful, being mottled with green, dove colour, black, and white, the two eye-like spots on segment 4 being very distinct. After a few hours, however, the green nearly all fades out and the chrysalis darkens to the tint of dead wood. In all parts of Canada there is only one brood of this butterfly. The eggs are laid in June and July and the caterpillars pupate late in the summer and go through the winter in the chrysalis state. The habits of the caterpillar are sluggish. From the first they spin a mat of silk to rest upon when not eating and sally out to feed. When very young they eat into the edge of the leaf upon which they hatch ; but as they grow larger they crawl away to other leaves near at hand, and return again to rest upon the same leaf, all the time there is food at a convenient distance ; when this is all consumed they move off to a fresh

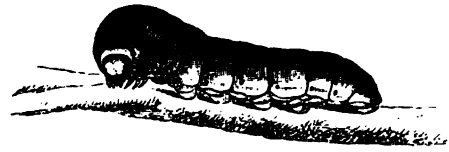

Figure 10.

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branch and start another centre of operations. This mat is so spun as to curl the leaf up somewhat and form a platform, so that in case of rain the caterpillar is raised above the wet leaf. When disturbed they have a special means of defence, in the shape of an orange forked scent-organ, which they can protude at will from an orifice in the second segment. At the same time a strong pungent odour is emitted. The caterpillars possess this organ in all their stages, but seldom use it except in the last stage. The food-plant of this insect is very varied. In this district it is most frequently found upon apple, cherry, ash, birch and aspen trees.

Figure 11 represents a very beautiful suffused melanic male, which

Figure 11.

was taken in July, 1888, by Mr. Robert Mackenzie, at Collins Inlet, upon the Georgian Bay, eighteen miles east of Killarney, Ont. As this is the only approach to a black male which has so far been discovered, it has been thought well to have it photographed and engraved. The specimen is in very fine condition, the black and yellow clear and unfaded. The red eye-spot at the anal angle is distinct, and there is another between the extremities of the second and third median veinlets of the hind wing. A few scales of blue shadow the spot at anal angle. There is a conspicuous cloud of the same colour between the second and third median veinlets and a smaller one between the first and second. At the apex of hind wing there is a light cloud of red scales, and a slight tinge of red between the extremities of costal and first subcostal veins.

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THE CLASSIFICATION OF OUR BUTTERFLIES.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

At different times, in making notes for a general list of our Lepidoptera, I have taken up the arrangement of our butterflies, and, although such a list must now be undertaken by some one else, I think it worth while to set down the conclusions to which I had come.

For myself, I have preferred to consider all the true butterflies as more nearly related to each other than to the *Hesperidæ* and *Paleohesperidæ*. In other words, the latter seem the equivalent, structurally speaking, of the other butterflies. The characters by which modern "families" are recognized are unequal, and perhaps these groups are really of no more than sub-family value. But, granting these groups to be as they are now held, families, the sequence, with the *Papilionidæ* at the head, seems less reasonable than that which commences with the *Nymphalidæ*, or the so-called "four-footed" butterflies. And this on general grounds. For it is a clear departure from the usually six-footed type, that the anterior pair should be shortened and rendered more or less useless for walking purposes. It is probably not to be assumed that the families evolved from each other, but evolution was simultaneous and unequal. The character of the shortening of the fore-feet appears in a less degree in other families of butterflies, and probably exists as a tendency latent in the whole group. The fore-feet become gradually disused in walking, and this disuse is followed by a modification of structure. We are tied to a linear series in our catalogues and classifications, and the real descent and sequence in time of our butterflies can never be made out and never displayed in our artificial arrangements. We are conditioned by our own physical structure. Our appreciation of what surrounds us is limited by the imperfection of our senses. We cannot *see* evolution, and the actual progression of growth escapes us. Only by reasoning do we recognize the doctrine of descent. It is easier for us to construct a genealogical tree than to prove its correctness beyond reasonable doubt.

Undoubtedly such drawings assist our comprehension of the possible *modus operandi*, but the artist must be exceedingly well up before he thus gives the reins to his imagination. In the best case they are not facts, and must not be accepted as such; they are, it may be, ladders for the mind, which we may climb if we will, to find at the top perhaps as imaginary

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a result as Jack attained from his bean-stalk. To draw such a tree may be pardonable, but to believe in it afterwards, as representing real succession, is an infirmity of the scholar's mind. Who can tell the real succession in time and place? There may be assumed a certain progression in the development of form, but beyond this there is nothing to justify our pretence that we are classifying our Lepidoptera according to real descent. Nature or natural selection deals with individuals; if the type persists, it is represented by species.

It may be that certain species of tropical *Papilio* are more recent evolutions, newer species, than many *Nymphalidæ;* but the four-footed butterfly must have come, one would think, from a six-footed ancestor. Hence, in a linear series, we may commence reasonably with the *Nymphalidæ.* Again, the habits of the larvæ of these latter are very complex, and seem to have been slowly modified and acquired. Mr. Edwards has told us much about them. The larvæ themselves are most curious objects, leaving the usual range of larval forms. In certain genera from South America are curious horns attached to the head, reaching backwards and reminding us of the flower spurs of *Aquilegia.* The larvæ of the *Papilionidæ,* as I have elsewhere said, are not without resemblances to the Hawk moths. As to pupation, it may be assumed that cocoon-making, or spinning, is older than its disuse. Almost all the "higher" groups, that is, groups which may have issued from a former complex, show some modification of this habit in the direction of its disuse. Thus the Hawk moths, which may have come from a common ancestry with the *Ceratocampinæ,* probably first passing through a type analogous to existing *Smerinthinæ,* have very generally discarded cocoon-making. In discussing all these matters, we must be careful not to put the cart before the horse, as the Chippeways did, who held the pretty notion that the butterfly made the south wind, and not the south wind the butterfly.

The *Papilionidæ,* in the consistency and form of the body, in its hairiness, in the dark and bright contrasting colors, in the tailing and structure of the secondaries, show certain approximations to the *Hesperidæ,* so that our placing them at the end of the true butterflies does not do violence to their structure. And as they are six-legged butterflies, we should naturally finish with them. The departure, which probably exists as a tendency in the group, is here not expressed, and they are like the *Hesperidæ* in this respect. But we must not look upon the *Papilionidæ*

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as a connecting link *(Uebergang)* to the *Hesperidæ*. They are, in most respects, as far from the skippers as any other true butterfly. The coincidences at best indicate that, in certain characters, the *Papilionidæ* stand nearer to the common ancestor than the *Nymphalidæ*. But whether our surmises are right or wrong—and that they are right or wrong cannot be proved, and is a matter of mere reasonable probability—we stand in need of a linear series for our catalogues and collections. This is a practical want, and we must meet it by the most philosophical means possible. We are offered a certain character in the true butterflies, the different modifications of the front pair of feet, and this character it is clearly philosophic and practical to use. We must not be influenced by slighter characters to overturn our conclusions, or by vague general considerations which are wide of the result we are aiming at, which is a *reasonable* sequence for our species, genera and families of butterflies.

I find that Mr. Wallace says that the *Danaidæ*, no less than the *Papilionidæ*, have developed complicated adaptations to the surrounding organic and inorganic universe. Adaptation, mimicry and dimorphism, depend evidently on climate and surroundings, and are not any proof of higher structural value in themselves. They are phenomena called forth by circumstance, with the plastic butterfly as the wax for the seal. Perhaps this very plasticity is a proof of a certain weakness of type, just as weakness of character in us is displayed by our attending to every wind that blows. "In the extensive family of *Nymphalidæ*," says Mr. Wallace, "we find that several of the larger species, of feebler structure, have their wings modified; while the powerful species, which have all an excessively rapid flight, have exactly the same form of wing in Celebes as in the other islands." Size or relative beauty are no guide for a structural arrangement.

I should commence, then, the linear series of our butterflies with the four-footed butterflies: First the *Nymphalidæ*, following these with the *Satyridæ*, which differ by the blistering of the veins of the fore-wings, and are considered by writers generally as a distinct "family." There have to be general considerations guiding our arrangement of the genera; and the knowledge requisite to form these is hardly gathered yet. A mere technical description of form and structure is not of itself sufficient. Comparisons are needed of all the stages. Again, in the stringing together of the mass of detail, the general principles which should guide us in estab-

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ishing the higher divisions are lost sight of. The *Satyridæ* are evidently "lower" than the *Nymphalidæ*, perhaps retaining in habits and markings traces of a former physical condition of the globe. I have written briefly, originally, on the habits and conditions of *Oeneis semidea*, and I regard this genus as a low, perhaps the lowest type of Satyrid. We now come to a series of "families" of butterflies in which the shortening of the fore-feet is confined to the male sex. These are the *Libytheidæ*, as I have thought, a very old form of butterfly (Can. Ent. XVIII., 163), the *Erycinidæ*, to which I would refer my genus *Feniseca*, and the *Lycæindæ*, in which the male fore tibiæ end in a hooklet. We now come to the six-footed butterflies, which we may divide into three "families," the *Pieridæ*, the *Parnassidæ* and the *Papilionidæ*. The *Hesperidæ*, which differ by the proportions of the body and position of the wings, fall into two groups, as the fore tibiæ are with or without epiphysis, and may then follow. The series of butterflies may be closed by my *Paleohesperidæ*, with spinose tibiæ,—moth-like butterflies preparing us for the *Castniadæ*, and apparently relics of a stage between moth and butterfly surviving in the North American fauna.

There is, I think, nothing to be gained by cataloguing our Lepidoptera upside down, as seems to be proposed by Packard, commencing with the supposed "lowest" moths. Theoretically we may conceive that the moths are "lower" than the butterflies, and that in some unknown way the latter have come from moth-like ancestors. Palæontological proof is now wanting, but there is some circumstantial evidence to be gathered that such has been the case. If there has been evolution, then butterfly-like forms cannot have produced moths, but the reverse. At a later epoch in the history of creation than the origin of butterflies, changes of climate have evidently taken place. The winter now finds the butterflies in all stages. The lethargy of the half-grown caterpillar seems to have survived from a time when the winters were longer, came more suddenly, than at present. It was no longer time for the butterfly to grow, or the food plant formerly then perished. Now there is time and food, but the butterfly will not yet believe it, needing the evidence of centuries, and prepares to winter. In the moths I only have observed that certain species remain as caterpillars within the cocoon until spring.

For practical purposes, as well as for the work of comparing the faunæ of North America and Europe, and arriving at some conclusions as

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to geographical distribution and origin of the different forms, in which I am much interested, we may arrange the butterflies as here suggested. But whether we assume eight "families" of the true butterflies, or only four, or only one, the sequence and the principle remain unaltered. The characters by which modern "families" are defined, chiefly by German authors *und solche die es werden wollen*, are of unequal morphological value, therefore unnatural and, it seems to me, unphilosophical.

NOTE ON THE LARVA OF THYATIRA PUDENS, GUEN.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

As far as I am aware no description of the larva of this insect has been published, and hence I present the following:—

T. pudens.—Mature larva. Head white, with four black spots, two covering the eyes and the others near the summit of the head. A few short, whitish hairs. Body semitransparent, whitish, flecked with opaque white spots on the dorsum and more thinly on the venter. Stigmatal space covered by a blackish shading, more distinct anteriorly; a darker dorsal line. Spiracles pale brown. Cervical spot whitish, concolorous with body. A few short pale hairs.

The larvæ feed singly on dogwood *(Cornus florida)*, each forming a place of concealment by spinning one or more leaves together by the edges. They mature by the middle of June and pupate in a slight cocoon on the ground, the winter being passed in the pupa state. The pupa has its greatest diameter through the wing cases, the abdominal segments tapering. It is dark brown, approaching black, the brown color showing more distinctly between the segments. Body punctured. Thorax, wing and leg cases finely wrinkled. Cremaster, thick, 1 mm. long, furnished with stiff, spiny hooks.

This larva well deserves its name of *pudens*, on account of its modest habits, remaining concealed in its leafy house, and appearing much disturbed if exposed. Its actions recall those of the larva of *Endamus tityrus*.

The insect has only one brood annually.

Larvæ from Duchess County, N. Y.

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PREPARATORY STAGES OF LEPTARCTIA CALIFORNIÆ WALKER, WITH NOTES ON THE GENUS.

BY G. H. FRENCH, CARBONDALE, ILL.

EGG.—Diameter .03 inch. Globular, smooth. Color whitish, with a pearly lustre. Duration of this period here four days, in the mountains of California six days.

YOUNG LARVA.—Length .07 inch. Cylindrical, six rows of tubercles from which spring hairs as long as the body. Color pale gray, head black, hairs gray. Duration of this period four days.

After 1st Moult.—Length .15 inch. Cylindrical, eight rows of tubercles, from which spring tufts of hair. Color dull pale horn yellow, a whitish dorsal line; tubercles black, the hairs gray; head with the top and sides black, clypeus whitish; legs whitish. Before the close of the preceding stage the body was slightly reddish purple. Duration of this period three days.

After 2nd Moult.—Length .25 inch.—Head slightly bilobed; color smoky greenish black; tubercles black, the hairs gray; a dorsal creamy, slightly orange tinted line, and a line of lateral spots of the same color situated between the second and third rows of tubercles, counting from the dorsal line; head pale horn yellow, the upper part black, a small black spot on each side, and a small smoky spot in the centre of the front; feet concolorous with the body. Duration of this period seven days.

After 3rd Moult.—Length .50 inch; shape as before. Color smoky gray, rather dark; dorsal stripe orange, an orange spot each side of the second tubercle on each joint, counting from the dorsal line; tubercles black, each supporting a cluster of spreading brown hairs, those on joints 6 to 11 mostly about the length of the diameter of the body, those on the other joints containing a few that are much longer, the anterior and a few on joint 12 yellow, a long pencil of brown hairs on 13; head dark amber, two blackish patches in front. Duration of this period six days.

After 4th Moult.—Length .60 inch. Color gray, made so by a fine mottling of black and sordid white; the cluster of hairs from each tubercle thick and spreading, the central hairs black, the outer hairs of the cluster gray; the dorsal line, lateral spots and head unchanged.

MATURE LARVA.—Length .70 inch. There was scarcely any change

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after the first of this period, As before, the body is cylindrical, with eight rows of tubercles, supporting tufts of spreading hairs, the most of these black with a few gray hairs round the outside of each cluster; the length of the hairs on the middle of body about the diameter of the body, those on the posterior part of the body about twice as long, the pencil from joint 13 about four times as long as those on the back of the middle joints; tubercles still black; head amber, with a prominent blackish spot in the centre of the anterior part of each cheek. Duration of this period 57 days.

CHRYSALIS.—Length .45 inch; length of wing and tongue cases .25 inch, extending almost to posterior part of joint 5; depth of joint 1 .14 inch; of joint 2 .15 inch; of joint 3 .16 inch; from this it tapers slightly to joint 7, from this more abruptly to the end; no hooks at anal extremity; cylindrical, anterior end rounded, the head sloping to the antennæ cases at a little less than 90 degrees; wing and antennæ cases slightly roughened, abdomen slightly punctured. Color, chestnut brown, antennæ cases and outer edges of wing cases a little paler. Duration of this period from 205 to 234 days.

There is but one brood in a season, and unlike most of our insects, it has two periods of what might be called suspended activity. One of these, the pupal period, is common to all insects undergoing complete transformations; the other, just before pupation, an unusual one, unless with a species that hibernates in the larval state. By looking over the different periods, we find them as follows:—

Egg	period....	6	days.
1st larval	"	4	"
2nd "	"	3	"
3rd "	"	7	"
4th "	"	6	"
5th "	" ..	57	"

After the fourth moult the larvæ grew to their full size in a few days, and then remained in a quiescent state, unless disturbed, during the remainder of the period. They passed the last moult July 25th, but did not pupate till September 20th. I could not see that they ate anything during this time of about 50 days, the period of our dry, hot weather, though fresh food was furnished them every day. At first I thought this

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might be due to their translation from their home in the Sierras to our warmer climate, and that succeeding broods would behave differently; but the second brood raised followed the same course as their ancestors.

When preparing to pupate, they constructed loose cocoons of gray silk mingled with hairs from their own bodies, either in folded leaves or next to the dirt in the corners of their breeding box. In this they resemble our Arctians generally.

The eggs from which the larvæ furnishing these notes were obtained were sent me by my friend, Hon. C. F. McGlashan, of Truckee, California. They were received by me July 5, 1885, just hatched, after having been on the road six days. Those I bred the next year hatched in four days. The food plant given me was Pentstemon, but I fed them on *Ribes Aureum*, or Missouri Currant, which they ate readily; and I am of the opinion, that like other Arctians, they are rather general feeders.

The only species, besides this, that has a period of summer hibernation in the Bombycidæ, so far as I have noticed, is the larva of *Arachnis Picta*, Pack., described by Mr. Stretch in his Illustrations of Zygaenidæ and Bombycidæ, page 84. This larva was found May 8th and did not pupate till the middle of August, making at least 98 days without food. The *Leptarctia* larvæ remained quiet under the food given them on the earth of the breeding box, unless disturbed, when they would run rapidly, like the species of *Arctia*. I believe Mr. Stretch says the Arachnis larvæ emitted a fluid just previous to pupation, similar to that emitted by a moth when coming out of chrysalis. I did not notice whether these did the same or not.

The genus Leptarctia was founded by Mr. R. H. Stretch in his book, already referred to, in the time of its publication from 1871 to 1873. At the time of writing the description of the genus he does not seem to have known of Walker's description of *Californiæ*, as he says nothing about it till the close of the work in an addenda. He gives three species, *Lena* and *Decia* by Boisduval, and *Dimidiata* named by himself. Walker described *Californiæ* in 1855 in British Mus. Cat. Lep. Het. Vol. 3, placing it in the genus *Nemeophila*. In 1868 Boisduval described the same form as *Adnata*, together with the two already mentioned, *Lena* and *Decia*, placing them in the genus *Lithosia*, but stating that in his opinion they did not belong in that genus, but in one near *Nemeophila*. Dr.

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Packard, in his "Synopsis of the Bombycidæ of the United States, 1864", does not mention any of the forms of *Leptarctia*, hence we may presume that he had not seen any of them. In the note already referred to, at the close of the volume, Stretch restores *Californiæ*, and gives *Lena* as a synonym. Grote, in his "New Check List of North American Moths, 1882", gives three names as species, *Decia*, *Lena* and *Dimidiata*, giving *Californiæ* as a synonym of *Lena*. The Brooklyn List, 1881, gives the same three names without *Californiæ*.

This is, as far as I have observed, a synopsis of the history of the forms that have been placed under the genus *Leptarctia* as species. Stretch figured several forms, but grouped them as varieties under the three species he gave. While, for lack of a large series, or the knowledge that could come from breeding, these writers have treated of these forms as species, yet there has been something of a feeling among Lepidopterists for several years that there was really only one species, and all the different forms but varieties, and that such would ultimately be proven.

(To be continued.)

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 200.)

As the descriptions are short and so generally unknown, I will reproduce them here:—

"Var. *hybrida*: Primaries of *D. bella*, but the yellow belts indistinct, secondaries of typical *D. ornatrix*, but with the ground colour red as in *D. bella*, and with a white edged, interrupted black belt across the discoidal cell.

"Hab.—United States.

"Var. *intermedia*: Primaries with the yellow belts very pale, so that the white borders of the black spots show faintly; secondaries exactly like *speciosa*.

"Hab.—United States."

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Genus CALLIMORPHA Latr.

This genus has been so thoroughly discussed by Mr. Lyman and myself in CAN. ENT., XIX, 181-191 and 235-239, that it is scarcely necessary to say anything more here.

The synonymy to the date of my monographic revision in the Proc. U. S. Natl. Mus., 1887, pp. 338-353, is there given with the complete bibliography. Nothing worthy of record has been published since that time, and I therefore add a list of the species for completeness only. As this genus has been monographically treated, I adopt my own order of species :—

C. clymene Brown.
  interruptomarginata DeB.
  comma Wlk.
C. colona Hbn.
  clymene || Esp.
  carolina Harr.
C. lactata Smith.
  ♂ *conscita* Wlk., in part.
C. lecontei Bdv.
  var. *militaris* Harr.
  confinis Wlk.
C. contigua Wlk.
  reversa Stretch, in part.
C. suffusa Smith.
  lecontei ‡ Stretch et auct.
  reversa Stretch, in part.
C. confusa Lyman.
  lecontei ‡ Smith et auct.
  reversa Stretch, in part.
C. fulvicosta Clem.
  ♂ *conscita* Wlk., var. *b*.
C. vestalis Pack.
  ♀ *conscita* Wlk.

Genus EPICALLIA Hbn.

1816—Hübner, Verzeichniss, 182.

Head small, retracted; palpi short; tongue short and weak, about half the length of thorax; ocelli small; antennæ short, simple in the ♂. Legs rather well developed, the middle and hind tibiæ fully spurred; spurs small, those of posterior tibia close together. Claws of tarsi simple.

Primaries with but 11 veins, 8 being wanting; 2, 3 and 4 are from a short stalk out of the end of the median; 5 from the cross vein rather close to the stalk, 6 and the stalk bearing 7, 9 and 10 from the end of the subcostal; 10 therefore *not* from the subcostal. Secondaries with 3, 4 and 5 close together from the end of the median; 6 and 7 together from the end of the subcostal; 8 as usual from the subcostal.

The above description is based upon *E. virginalis*. Mr. Butler thinks the American entomologists have mistaken the type of *Epicallia*.

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He says, Ann. Mag., N. H., 1881, ser. 5, v. VIII., p. 310:—"Why Dr. Packard and others have placed this species in *Epicallia*, of which *E. villica* is type, it would indeed be hard to say. Setting aside other differences, the utter dissimilarity of the male antennæ should have been sufficient to keep them widely separated. The pattern and colour of the wings, the less woolly and smaller thorax, and the barred abdomen are all characteristic of *Hypercompa;* in fact, with the exception of the rather shorter costal margin of primaries, which may, perhaps, be regarded as a generic character, I can see nothing to distinguish it from that genus." Mr. Butler claims *dominula* and allies as *Hypercompa (Callimorpha* Stgr.), and says our species of *Hypercompa (Callimorpha)* differ generically from the European species, and should be referred to *Haploa* Hüb. *Villica*, according to Butler the type of *Epicallia*, is placed in *Arctia* by Staudinger.

Without expressing any opinion on the subject, I refer the matter to some one having the material for study.

E. virginalis Bdv.

1852—Bdv., Lep. Calif. (Ann. Soc. Ent. Fr.), 49, *Chelonia.*
1855—Wlk., C. B. Mus. Lep. Het., III., 611, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 529, *Arctia.*
1862—Clem., App. to Morris Syn., 337, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 108, *Epicallia.*
1867—Grt. & Rob., Tr. Am. Ent. Soc., I., 333, pl. 6, f. 42, ♂, *Epicallia.*
1873—Stretch,* Zyg. & Bomb., 70, 238, pl. 3, ff. 2, 3, 4, and pl. 10, f. 1 (larva) *Epicallia.*
1874—Pack.,* Rept. Geol. Surv., 1874, p. 559, *Epicallia.*
1875—Edw.,* Proc. Cal. Ac. Sci., V., 186, *Epicallia,*
1876—Stretch, Rept. Surv. West. 100 Mer, V., 802, *Epicallia.*
1881—Butler, Ann. Mag., N. H., Ser. 5, VIII., 310, *Hypercompa.* var. *ochracea* Butler.
1881—Butl., Ann. Mag., N. H., Ser. 5, VIII., 310, *Hypercompa* Cites Stretch, Zyg. & Bomb., p. 71, pl. 3, f. 2, as type. var. *guttata* Bdv.
1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 48, *Agarista.*
1853—H.-Sch., Lep. Exot., 72, f. 464, *Pleretes.*
1862—Morris, Synopsis, 132, *Alypia.*

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1864—Pack., Proc. Ent. Soc., Phil., III., 109, pr. var.
1867—G. & R., Trans. Am. Ent. Soc., I., 334, an sp. dist.
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg. XII), 74, *Callimorpha.*
1873—Stretch, Zyg. & Bomb., 70, pr. var.
1875—Edw., Proc. Cal. Ac. Sci., V., 186, pr. var.
Habitat—Vanc., Calif., Or., Colo., Ariz.

Genus PLATARCTIA Packard.

1864—Pack., Proc. Ent. Soc., Phil., III., 109.

I have no notes of this genus, never having had a specimen that belonged to me absolutely.

P. borealis Moeschler.

1860—Moeschl., Wien. Ent Monatsch., IV., 360, pl. 9, f. 3, *Arctia.*
1864—Grt., Proc. Ent. Soc., Phil., III., 74, =*parthenos.*
1864—Pack., Proc. Ent. Soc., Phil., III., 111, *Platarctia.*
1867—Pack., Proc. Bost. Soc., N. H., XI., 35, *Platarctia.*
1869—Beth., CAN. ENT., I., 45, *Platarctia.*
1873—Strk., Lep. Rhop. et. Het, 24, =*parthenos.*
1882—Grt., New List, 15, *Platarctia.*
Habitat—Can., Labr.

Mr. Grote lists this as a distinct species without comment, and I follow his lead. It is the opinion of those with both species, I believe, that *parthenos* and *borealis* refer to varieties of the same form.

P. hyperborea Curtis.

1831—Curt., App. to Ross. Narr., 2nd Voy., LXXI., p. 17, *Eyprepia.*
1855—Wlk., C. B. Mus. Lep. Het., III., 611, *Arctia.*
1857—Wlk., C. B. Mus. Lep. Het., VII., 1692, *Arctia.*
1860—Clem, Proc. Ac. N. Sci., Phil., XII., 529, *Arctia.*
1862—Morris, Synopsis, Supplt., 340, *Arctia.*
1868—Grt. & Rob. Tr. Am. Ent. Soc., II., 71, *Platarctia.*
Habitat—Arctic America.

P. parthenos Harris.

1850—Harr. in Ag. Lake Sup., 390, pl. VII., f. 4, *Arctia.*
1855—Wlk., C. B. Mus. Lep. Het., III., 608, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 529, *Arctia.*
1862—Morris, Synopsis, Supplt., 337, *Arctia.*

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1863—Saund., Syn. Can. Arct., 4, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 110, *Platarctia.*
1868—Saund.,* CAN. ENT., I., 5, *Platarctia.*
1869—Bethune, CAN. ENT., I., 45, *Platarctia.*
1871—Saund.,* CAN. ENT., III., 225, *Platarctia.*
1872—Lint.,* Ento. Contr., II., 132, *Platarctia.*
americana ‡ Wlk.
1855—Wlk., C. B. Mus. Lep. Het., III., 607, *Arctia.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. syn.
Habitat—Can., Lake Sup., White Mts., Vt., N. Y.

P. yarrowi Stretch.
1873—Str., Zyg. and Bomb., 221, pl. IX., f. 7, ♂, *Arctia.*
1876—Str., Rept. Geog. Surv. West, 100 Mer., V., 800, pl. 40, ff. 1 and 2, *Arctia.*
1882—Grt., New List, 15, *Platarctia.*
1883—Moeschl., Stett. Ent. Zeit., 44, 116, *Arctia.*
Habitat—Labr., Arizona.

Genus EUPREPIA Ochs.

1810—Ochs., Schmett., III., 298.

Von Heineman's characterization gives for this genus:—Antennæ ♂ and ♀ ciliated, joints with two stouter bristles; anterior tibia with claw at tip. Primaries with accessory cell present. Based upon an examination of *E. caja*, the reference of that species to this genus is an error, since *caja* has the male antennæ pectinated, the fore tibia with but a small spine at tip, primaries without accessory cell. In *caja* the tongue is obsolete, palpi short, head retracted. All the tibiæ shorter than femora; spurs normal, but minute. Claws simple. Primaries with 3, 4 and 5 nearly equidistant from the cross vein or end of median; 6 from cross vein, very little below end of subcostal; 7, 8 and 9 on a long stalk out of end of subcostal; 10 from subcostal before the end of the cell; secondaries with 3, 4 and 5 nearly equidistant from end of median; 6 and 7 together from end of subcostal.

Pudica is said to be the type of the genus!

E. caja Linn.
1758—Linn., Syst. Nat. Ed., X., 500, *Bombyx.*
1767—Linn., Syst. Nat. Ed., XII., 819, *Bombyx.*

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1781—Fabr., Sp. Ins., II., 198, *Bombyx*.
1787—Fabr., Mant. Ins., II., 128, *Bombyx*.
1816—Hübn., Verzeichniss, 181, *Zoote*.
1852—Bdv., Lep. Cal. (Ann. Soc. Fr.), 49, *Arctia*.
1855—Wlk., C. B. Mus. Lep. Het., III., 601, *Arctia*.
1860—Moeschl., Wien. Ent. Monatschr., IV., 360, *Arctia*.
1864—Grt., Pr. Ent. Soc., Phil., III., 74, an. sp. Amer. (?).
1867—Pack.,* Proc. Bost. Soc., N. H., XI., 33, *Euprepia*.
americana Harris.
1841—Harris, Rept. Ins., Mass., 246, *Arctia*.
1850—Harris in Ag., Lake Sup., 391, pl. 7, f. 5, *Arctia*.
1855—Wlk., C. B. M., Lep. Het., III., 607, *Arctia*.
1860—Clem., Proc. Ac. N. Sci., Phil. XII., 529, *Arctia*.
1862—Clem., App. to Morris Syn., 336, *Arctia*.
1863—Saund.,* Proc. Ent. Soc., Phil. II., 28, *Arctia*.
1863—Saund., Syn. Can. Arct., 3, *Arctia*.
1864—Pack., Proc. Ent. Soc., Phil., III., 114, *Euprepia*.
1869—Grt., Tr. Am. Ent. Soc., III., 537, an sp. dist., *caja*.
1872—Lintner,* Ent. Cont., II., 134, *Euprepia*.
1873—Stretch, Zyg. & Bomb., 95, pl. 4, f. 4, ♀, ib., p. 239 (larva) =*caja*.
1873—Strecker, Lep. Rhop. et. Het., 24, *caja*.
1875—Edw., Proc. Cal. Soc. Sci., V., 187, *Euprepia*.
1875—Bunker,* CAN. ENT., VII., 149, *Arctia* (life list).
1876—Lyman,* CAN. ENT., VIII., 20, *Arctia*.
1878—Strk., Proc. Dav. Ac. Sci., II., 273, pr. syn.
1882—Grt., New List, 15, =*caja*.
var. *utahensis* Edw.
1886—Edw., Ent. Amer., II., 166, *Euprepia*.
Habitat—Northern U. S., N. Y., Can., Labr., Alaska, Vanc., Calif., Utah.

I have made no attempt to give the bibliography of the European species. It would have made the references too voluminous, and the European literature is rather easily kept track of.

E. opulenta Hy. Edw.
1881—Edw., Papilio, I., 30, *Euprepia*.
Habitat—Yukon River, Alaska.

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Genus CALLARCTIA Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 114.

This genus is unknown to me in nature, unless Mr. Stretch's reference, hereinafter cited, is correct. In that case it needs no special characterization.

C. ornata Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 115, *Callarctia.*
1882—Stretch, Papilio, II., 147, =*Arctia achaia*?
Habitat—San Mateo, Calif.

Mr. Stretch's note, giving the above synonymical reference, seems to have been carefully made, and the description shows nothing to the contrary. The reference bears all the more weight since Mr. Stretch is not a lumper, and has shown in the past great deference to Dr. Packard's *dicta* in this family. Grote & Robinson's species must, therefore, drop as a synonym, while Dr. Packard's genus must fall. I leave the positive reference to others.

THE ASSOCIATION OF OFFICIAL ECONOMIC ENTOMOLOGISTS

will hold its first annual meeting in the City of Washington, D. C., on November 12th, 1889, at 11 o'clock, a. m., in the Entomological rooms at the U. S. National Museum.

According to the resolution of the Association at the Toronto meeting, the annual meeting was to be held on the date and at the place where the Association of Agricultural Colleges and Experiment Stations should next meet. The date and place for the latter meeting having been fixed, the above notice is hereby given to all members of the Association of Economic Entomologists. All titles of communications to be read should be sent to the Secretary as soon as possible, and those desiring enrolment as members will also please communicate with the Secretary.

JOHN B. SMITH, Rutger's College, New Brunswick, N. J.

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CORRESPONDENCE.

THE FARMER'S OWN INSECTICIDE.

Dear Sir: Take plants of Pokeweed, *(Phytolacca decandra)*, roots, stems and leaves; cut them into manageable lengths; make a decoction —a sap-kettle will be useful for the purpose. Let the liquor cool, and then apply with a sprinkler. This will exterminate the currant-worm, rose-slug and other pests of the garden.

THOMAS W. FYLES.

GNOPHÆLA VERMICULATA, Grote.

Dear Sir: Last year Mr. Bruce published a description of the larva of this insect, giving the food-plant as *Mertensia virginica* (L.) As Prof. J. B. Smith has repeated this record in CAN. ENT. XXI., p. 174, it becomes especially necessary to point out that it is probably erroneous. In the first place, *M. virginica* is not known to occur in Colorado, and the species known from the Platte basin, in that State, are *M. sibirica*, Don., *M. alpina*, Don., and *M. paniculata*, Don.,—the last a new record, being reported from Denver by Miss A. Eastwood. Secondly, the larva of *G. vermiculata* is common in Custer County from 8,000 to 10,000 feet alt., and is found on *Mertensia sibirica*, although I have rarely found it also on *Echinospermum floribundum*, Lehm. I think, therefore, we may regard *M. sibirica* and *E. floribundum* as the known food-plants of *G. vermiculata*, and throw over *M. virginica* as erroneous, unless Mr. Bruce has anything to say to the contrary. I have elsewhere described the larva and pupa of this insect, and as I have since found the egg, this will be a convenient time to offer a description:—*G. vermiculata:* egg, diam. one mill; spherical, flattened at base; pale yellow, smooth, rather shiny. Laid in clusters on leaves of *M. sibirica*. Micawber Mine, Brush Creek, Custer Co., Colo., about 10,000 feet alt., or over. August, 1889. *G. vermiculata* occurs very abundantly in the higher regions of the Arkansas Basin in Colorado, but I have not heard of it on the Pacific slope. It flies lazily by day, visiting especially the flowers of *Senecia* and *Gymnolomia*.

West Cliff, Custer Co., Colo. T. D. A. COCKERELL.

Mailed November 5th.

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The Canadian Entomologist.

VOL. XXI. LONDON, DECEMBER, 1889. No. 12.

PREPARATORY STAGES OF LEPTARCTIA CALIFORNIÆ WALKER, WITH NOTES ON THE GENUS.

BY G. H. FRENCH, CARBONDALE, ILL.

Continued from page 213.

The first to express this belief and put it in a tangible shape before the public was Mr. A. G. Butler, who published a paper in the Ann. Mag. Nat. Hist., based upon a collection of moths made by Lord Walsingham in Oregon. He states he does not hesitate to say that he believes that the different forms do not represent several distinct species, but different forms or varieties of one extremely variable species. The four names that had been used he retains as names of the four forms they were originally intended to represent, and gives in addition four new names. According to Mr. Butler's idea they would stand as follows:

LEPTARCTIA CALIFORNIÆ.

Var. 1, Stretchii, Butler.
" 2, Boisduvalii, Butler.
" 3, Dimidiata, Stretch.
" 4, Latifasciata, Butler.
" 5, Fulvofasciata, Butler.
" 6, Californiæ, Walker (type).
" 7, Decia, Boisduval.
" 8, Lena, Boisduval.

He does not describe these in full, but bases his description on the work of Stretch, Ills., Zyg. and Bomb., using the figures on plate 5.

I have before me representations of all but one of Mr. Butler's varieties in my own collection, and those loaned me by my friend, Mr. W. G. Wright, of San Bernardino, California, and three forms that are not referable to any of his. The second variety, *Boisduvalii*, I have not seen: but it is figured by Stretch. From the series I have, I deduce the following brief descriptions, and from them have had made the wood engravings illustrating the different varieties.

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LEPTARCTIA CALIFORNIÆ.

Var. 1, *Stretchii*, Butler (Fig. 12). In this the fore-wings are black, with the zig-zag transverse line pinkish white, a spot of same near the posterior angle and a basal dash. Hind wings black, with a few crimson scales in a transverse row beyond the middle. Under side, fore-wings crimson; a black terminal border, broadest at apex; whitish along the costa. Hind wings black, a little red in the outer part of cell.

FIG. 12.

Two ♂'s from Southern California.

Var. 2, *Boisduvalii*, Butler (Fig. 13). This has the fore-wings black with the transverse band pinkish white, arcuate but not zig-zag, a brief basal dash. Hind wings black with the transverse band, as described by Mr. Stretch, "bright orange red." Described by him from Oregon.

FIG. 13.

Var. 3, *Dimidiata*, Stretch (Fig. 14). Fore-wings black, two whitish spots on the costa and one near posterior angle. In bright examples of this genus three more or less distinct transverse bands may be recognized, usually gray and black with more or less of white blotches in them. The first costal spot here is in band 2 and the other two are in band 3. Hind wings black in my example. Mr. Butler says it may have "a slightly curved series of small ochreous or crimson spots just beyond the middle." Under side, fore-wings black, a broad whitish band from above the cell to posterior angle, and the costal white spot of band 3 repeated. Hind wings slightly flecked with light near the anal angle.

FIG. 14.

One ♂ from Colorado.

Var. 4, *Albifascia*, French (Fig. 15). This has both wings black with a broad white band across the fore-wings. It is the same as *Boisduvalii*, excepting the crimson band on the hind wings. There is no basal dash or other mark on the fore-wings. Under side, fore-wings black to a little beyond the first third, terminal portion black, attenuated

FIG. 15.

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to a point at posterior angle; the rest of wing ochreous white. Hind wings black. Body black, a white line from antennæ back over patagia, sides of anterior and middle femora and sides of anterior tibiæ red, as in the other varieties.

One ♂ from California.

Var. 5, *Occidentalis*, French (Fig. 16). Fore-wings black, a whitish basal dash and three blurred whitish spots in bands 2 and 3. Hind wings black, marked with orange as shown in the figure. Under side, fore-wings orange, a narrow terminal black border, black along the posterior margin, veins narrowly black. Hind wings black with an orange terminal and subterminal band, both united by a broad ray that passes through the cell to outer margin. Stripe on side of abdomen orange.

FIG. 16.

One ♀ from Northern California.

Var. 6, *Latifasciata*, Butler. (Fig. 17, hind wings with the band *crimson*). Fore-wings black, with three small white spots on bands 2 and 3. Hind wings black, with the median band crimson. My specimen has this band a little more irregular than the figure. Under side, fore-wings with extreme base and terminal third black, the rest crimson, whitish along the edge of the red. Hind wings with the red of the upper surface repeated.

FIG. 17.

One ♂ from Southern California.

FIG. 18.

Var. 7, *Fulvofasciata*, Butler. (Fig. 17, hind wings with the band *yellow*). This is the counterpart of Var. 6, except that the band of the hind wings is pale yellow instead of crimson. My examples show a tendency to a fine pale ray or two from the base of the hind wings towards the yellow bands, while Mr. Wright's specimen does not show this tendency.

Three ♂'s, two from Truckee, Cal., the other from California, but part of State not indicated.

Var. 8, *Californiæ*, Walker (Typical). (Fig. 18, the light parts of

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hind wings *yellow*. Fig. 19 shows the under side). Fore wings black, sprinkled with gray scales so as to give a gray cast to the wing; the three transverse-bands distinct; black, with numerous whitish spots; a basal whitish dash. Hind wings, with the light parts pale yellow. In some the central black band is broken, and in others wanting, only the two black rays and terminal border being present. Under side as in the figure, the yellow pale, and streaked a little at base with red.

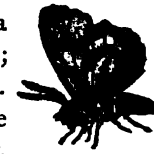

FIG. 19.

Ten ♂'s from Truckee, one ♂ from Southern California.

Var. 9, *Wrightii*, French. (Fig. 18, the light parts of hind wings *crimson*. Fig. 19 shows under side). This is like Var. 8, except that the light parts of hind wings are crimson instead of yellow, and the fore wings are less gray tinted. The fore-wings have, instead of numerous white spots in the bands, one at posterior angle and two on costa, with the basal dash. The under surface is shown at fig. 19, and is crimson instead of yellow.

FIG. 20.

One ♂ from Southern California.

Var. 10, *Decia*, Boisduval. (Fig. 20, hind wings *crimson;* under side shown in fig. 21). Fore-wings black, the bands more or less marked by whitish spots; basal dash present. Hind wings crimson, a terminal black border, more or less broken. Under side crimson with terminal black border as in fig. 21, or a few intergrades between this and Var. 9, with a transverse band, as shown in fig. 19.

FIG. 21.

Nine ♂'s and one ♀ with three ♂ intergrades with *Wrightii*, and three ♂ intergrades with *Latifasciata*, all from California.

Var. 11, *Lena*, Boisduval. (Fig. 20, the hind wings *yellow;* the under side shown in fig. 21. Fig. 22 shows an extremely light form). Fore-wings black, tinged with gray; the three transverse bands more or less distinct, both by the clear black without gray, and by the whitish spots. In three specimens from Colorado the bands are almost continuous white,

FIG. 22.

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as shown in fig. 22. Hind wings yellow, with a terminal black border; sometimes much broken, as in fig. 22. Under side in fig. 21, the light part yellow, more or less red stained at base.

One ♂ from Southern California, three ♂'s from Colorado, two ♀'s from Truckee, Cal., and five ♀'s from other parts of California. Besides this there are two ♀ intergrades with *Decia* from Colorado, four ♀ intergrades with *Decia* from Truckee, Cal., and two ♂'s and one ♀ intergrade with *Decia* from Southern California.

One of the principal variations in these forms is found in the amount of black on the hind wings, ranging from wholly black to a few black spots as a terminal border. The first breaking up of the solid black is found in a single light point near anal angle, then a few pale scales across the wing, next a band of light, in the succeeding stage the basal part invaded by pale rays, and finally all the black obliterate except the terminal border. In the specimens having only the terminal border of black, there is a fine penciling of black along the veins, and in the intergrades between *Wrightii* and *Decia* a gradual fading out of both the transverse band and rays may be found till there is nothing but the obliterate penciling of the veins left. Variety 5, *Occidentalis*, seems to be an irregular form that only partially falls within the line of the regular variation. The fore-wings are black in the red forms, with but little if any gray tint; in the yellow forms, slightly gray tinted, with three more or less distinct transverse bands, which in the gray wings lack the gray tint, and contain in nearly all of them a few white or whitish spots. When only a few spots are present, these are costal in second and third band, and one at posterior angle in third band. Varieties 1, 2 and 4 seem to come from an unusal development of the second band.

The varieties are largely local. The prevailing color of Southern California examples, as seen by the localities under the several varieties, is crimson; the Sierra Nevada and Colorado forms are mostly yellow, and the Oregon and North California forms are orange. These are the prevailing colors. In the Truckee specimens all my males were yellow and females varying from almost a distinctive orange to yellow, with traces of the red tinge along the veins (of hind wings, of course). In Lord Walsingham's collection from Oregon the prevailing color was orange, and we find that color extending into California. But in each of

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these localities there is enough intergrading in color to show the affinity of the different forms.

NOTE.—Varieties 4, 5 and 9 are in the cabinet of Mr. W. G. Wright, of San Bernardino, Cal. I think 4 and 5 were obtained by him from Mr. James Behrens, of San Francisco, and probably both were from Northern California.

THE NOCTUIDÆ OF NORTH AMERICA AND EUROPE COMPARED.

(Fourth Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Arzamini.*

The pale or yellow coloured species of *Gortyna*, the caterpillars being internal feeders, pupating, however, in the ground, prepare us for the *Nonagriini.* We have, however, in North America, a peculiar tribe which I have called *Arzamini*, and which I here interpolate. The caterpillar was first discovered by Prof. Comstock, in Florida Lakes, in the leaf-stalks of the pond lily. This was the larva of *A. vulnifica* var. *melanopyga*, and subsequently in the lake at Ithaca, the larva of the typical *vulnifica* was observed by the same distinguished entomologist. The larva is furnished with nine pairs of spiracles, and passes freely on the water from one leaf to another. Subsequently, the larva of *Sphida obliquata* was described by Prof. Kellicott. The moths of this tribe are related to the Nonagrians, but differ by the bluntly terminating abdomen of the female, recalling certain *Lachneinæ* in appearance. There are two genera: *Arzama*, with three distinct species (of which I owed specimens of *A. diffusa* to my excellent friend Mr. Moffat) in which the front is smooth, and *Sphida*, with the single species *obliquata*, in which the front is tuberculate. This appears not to be a variable or sexual character in the moths, as it may be in certain *Scarabeidæ*, but is in Lederer's opinion, with which I agree, of generic value. If we are not so to consider the tibial armature, or the conformation of the clypeus in the *Noctuidæ*, there remain few characters which we may use as generic. I am disposed to consider, then, *Copimamestra*, which differs from *Mamestra* by the tibial

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claw and *Sphida*, which differs from *Arzama* by the clypeal tubercle, as independent genera on the strength of these single characters. The tribe *Arzamini* is not represented in Europe, and, beyond the *Dicopini*, is so far the first distinct structural departure in North America from the European types. While *Dicopis* and allies resemble the *Bombycoidi* or certain *Hadenini* in appearance, the *Arzamini* have a distinct and singular form, and, while their affinities evidently lie with the Nonagrians, their peculiar larval structure and habit clearly warrants our considering them as constituting a distinct group or tribe of the *Noctuidæ*. The resemblance in the female abdomen of the *Arzamini* to the Bombycid genus *Eriogaster*, and the unusual larval condition, lends interest to this tribe. May we not consider the *Arzamini* as an American survival of a very ancient form of the *Noctuidæ*?

Tribe *Nonagriini*.

This tribe differs from the *Hadenini* in the absence of body tuftings, and in the finer, smoother vestiture; only in a few genera is there a median thoracic ridge. In these characters *Gortyna* agrees with the *Hadenini*; the habit of the larva probably associates *Euthisanotia*, a tropical genus with foot-hold in Florida, with *Gortyna*. The present tribe is one of the most interesting of the family. The moths are pale or straw-coloured, some with a warmer, a little red or ochre tint, and the larvæ feed in reeds or grass. *Nonagria* has a stout, clypeal projection, and naked eyes; the larva lives in the stems of *Typha* and *Phragmites*, pupating in its burrow. We have eight North American species described; probably many more remain to be discovered, as the moths must be bred, and are not often captured. In Europe, seven are known. So far as known to me, our species are not like the European, or representative. We have an immense species, with the proportions of a small *Sphinx*, from Florida, my *N. permagna*. Our most usual species, perhaps, in the east, of moderate size, is my *subflava*. No species are known to me from California, but we must expect that they await discovery. These *Noctuidæ*, with boring larvæ, inhabiting swamps, must be an old form of the family, once, at least, of very general distribution. The European genus *Coenobia*, with one species, I have not found in North America, but I discovered a Western American genus *Fota*, with two small species, which, from its clypeal

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structure and other characters, seems to belong here. I have described one American species of *Senta*, figured in the Buffalo Bulletin (1874); the figures on this plate are in some copies coloured. Of the European genus *Tapinostola*, two North American species are described, one only have I seen. The European genera *Meliana* and *Calamia*, with single species, are apparently wanting in North America; but we have a peculiar genus in *Ommatostola*, with lashed eyes. *Heliophila* Hüb. (= *Leucania* Ochs.) is, perhaps, the leading genus of the group; and, like *Apatela*, *Agrotis*, *Hadena* and *Mamestra*, contains identical and representative species. The eyes are hairy, the thorax smooth, the male antennæ impectinate, the body rather stout, the legs in some species thickly haired. Probably a resemblance of ornamentation between *Pseudolimacodes niveicostatus* and the European *Heliophila conigera*, led Guenèe, although the eyes in the former are naked (but Guenèe does not study this character), to describe our species, which I am disposed to refer even to a different sub-family, as belonging to *Leucania*. We have probably one identical species of *Heliophila* with Europe: *H. pallens*. Our *H. pseudargyria* seems to be allied to *lithargyria*, while we have a number of species resembling the European *obsoleta*, *straminea*. *comma*, *littoralis*, etc. No species have yet been found in North America at all resembling the European *evidens*, *conigera*, *vitellina*, *turca*. The well-known "Army Worm" *Heliophila unipuncta*, has been taken in England, and in the Madeira Islands, probably introduced from North America. Although single species may have now a wider range, I think we must conclude that the genus *Heliophila*, in North America, belongs to the European element, and is descended from a former common circumpolar fauna. These insects must be collected at light in the neighborhood of swamps and waters by which reeds and flags grow. In the stems of these we may find, in June and July, the grown caterpillars or pupæ of *Nonagria*. The European genera *Mycteroplus*, *Argyrospila*, *Mythimna*, with single or few species, are undescribed in our fauna. It seems probable that our Nonagrians are quite incompletely known, and that in North America, from which twenty-seven species of *Heliophila* are described, while Europe numbers thirty-two, many interesting discoveries await the entomologist in the present group. I have referred here the Californian genus *Zosteropoda*, from the shape of the wings and the tufted legs; and, as in other tribes,

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North America is already credited with peculiar genera, with few species, clustering about the two principal genera, which are here : *Nonagria* and *Heliophila.*

Tribe *Scolecampini.*

The body is slender, smoothly haired; the legs unarmed, thinly scaled, rather long; the wings vary from rather broad to quite narrow; the colors are mainly of the preceding group, and the caterpillar of *Scolecocampa* is said to burrow in wood. This tribe, with the *Arzamini*, is exclusively American, and may be considered, equally with that, to be an outgrowth of the Nonagrians. I refer here (see CAN. ENT. XV., 131) the genera *Scolecocampa*, *Eucalyptera*, *Amolita*, *Cilla*, *Doryodes*, *Phiprosopus.* Geyer's figure of *S. liburna* has the primaries shaded with red, a feature I have noticed in fresh Southern examples of the moth. Mr. Morrison seems to have had no notion of the affinities of his *Eucalyptera bipuncta;* I referred the moth to *Scolecocampa*, the differences seeming only comparative, or of specific value. Since then I found a second Western form, and, although the differences are not very decided, I adopt the genus. In this tribe the ornamentation seems a modification of the usual Heliophilid type. The longitudinal medium stripe, the pale oblique shade to the still pointed primaries, the dots and dotted stigmata, varying in expression in the different genera, are Heliophilid features; while the oblique and longer palpi, often smoky on the sides, the slender feet and linean body distinguish the tribe. *Doryodes* is described as a Geometrid by Guenèe, and *Phiprosopus* (printed *Phyprosopus*, originally in error) is described, under characteristics which do not belong to the genus and were accidental in the type, equally as a Geometrid by Zeller, who subsequently acknowledged my prior and more correct reference of *P. callitrichoides* to the *Noctuidæ.* The chiloform appearance of most of the genera becomes almost lost in *Phiprosopus*, notwithstanding the narrow wings, while the labial palpi depart from the usual form; these latter, and the peculiar color, remind one of certain exotic genera allied to *Calpe*, where I was at first disposed to locate the genus. When the immature stages are known, our present views may be modified. Always must our classifications be judged by their reasonableness in reference to the existing knowledge of the whole history of the insects.

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Tribe *Caradrini.*

In this tribe, in which the body is still smoothly scaled, or with very slight tufts, the eyes naked, the tibiæ unarmed, the two principal European genera are represented in North America. In *Caradrina*, twenty-eight European species are described, while but eleven have so far been discovered in North America. Of these, *Miranda* seems to be exceedingly near the rare and local European *lepigone*, while others have the European facies. The species of *Pyrophila (=Amphipyra)* are interesting as affording one identical species, *tragopogonis*, and one representative, *pyramidoides*. Whether the former is a survival or an importation is uncertain, I have been inclined to believe the latter is the case. The species of *Pyrophila* are large and so exceedingly like the flat species of *Agrotis*, that (when in the south away fro m my microscope) I mistook *tragopogonis*, communicated to me by Prof. Saunders as injurious to grape, for an *Agrotis*. The unarmed legs separate the present genus; but the habit is similar, as I have observed *pyramidoides* beneath the bark of decaying trees in the woods. Upon the loose bark being removed the moths endeavored to escape by running. Li ke cockroaches, the smooth greasy-looking vestiture, and the flat shape, evidently facilitate their movements in such places of concealment; I have observed species of *Agrotis saucia*, etc., in their company. The question of whether we should not bring in the *Agrotini*, between the *Caradrini* and the *Orthosini*, is yet, perhaps, an open one. No reasons are given by Lederer for not following the arrangement of older authors; but it is better to conform in such cases to Lederer's example, as it is followed in Europe, and since my main object has been always to bring the two faunæ under the same artificial system, so that they can be compared, the differences and resemblances taken note of. In the present tribe the derivation of one part of our fauna is very clear. The European *pyramided*, and our *pyramidoides*, are descended from one stock. We have apparently failed to take over the other large and showy species of *Pyrophila* found in Europe, as I have seen nothing like them in any North American collection. In the west is found my *Fotella notalis*, a moth apparently allied to *Acosmetia*; this latter, with the other European Caradrinid genera, I have not recognized in North America. I am uncertain as to whether *Adipsophanes* and *Crambodes* should not be included in this tribe; the former genus includes my *miscellus* and *terminellus*, the latter Guenèe's *talidiformis*.

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THE NORTH AMERICAN CALLIMORPHAS.

A REPLY TO CRITICS.

BY H. H. LYMAN, MONTREAL.

Since my article on the North American *Callimorphas* appeared in the CANADIAN ENTOMOLOGIST for October, 1887, a number of papers upon the same subject, and containing certain criticisms of my views, appeared in subsequent numbers of this magazine, and in Entomologica Americana; and, in addition, I received certain letters upon the same subject from entomologists to whom I had sent copies of my article. To these critics I now propose to make a perhaps rather tardy reply :—

Mr. J. B. Smith had spoken before the Entomological Club of the A. A. A. S. upon this subject, and the discussion had been reported in Entomologica Americana, but, as Mr. Smith surmised, I had not seen the report till after my paper was in the hands of the printer; and, although Mr. Smith's paper in the Proceedings of the National Museum appeared before mine, I did not hear of its issue till after the publication of my own. In the CANADIAN ENTOMOLOGIST for December, 1887, appeared Mr. Smith's review of my paper, in which he admitted the correctness of my determination of the true *Lecontei* of Boisduval, and of many of my contentions, though expressing his dissent from others, especially in the matter of nomenclature. There was, however, one typographical error of some importance in that paper, on page 236, line 27, where the figures 6 and 8 should have been 4 and 6. In that paper, Mr. Smith arranged the species of this genus in a slightly different order from that adopted by me, by changing the order of the two forms *Confusa* and *Suffusa*.

This is a small matter, and one about which I am not disposed to quarrel, especially as it seems to me that no linear arrangement of species can ever be quite satisfactory, as to correctly express the full relationship of species, we should require to group them in all three dimensions of space. But the chief issues between us were whether *Vestalis* should be regarded as a distinct species, or only a synonym of *Fulvicosta*, and as to the correct application of the names *Conscita*, *Lactata*, *Confusa*, *Suffusa* and *Reversa*.

In regard to the first point, Mr. Smith conjectured that I had never seen a true *Vestalis*, and he very kindly sent me a specimen as typical of that form. This specimen is certainly very remarkable, as it is much

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smaller than any specimen of *Fulvicosta* that I ever saw, measuring only 38½ mm. in expanse, and is, as Mr. Smith says, "whiter and more frail and *Euchætes* like," though it has none of the semi-diaphanous appearance of *E. Collaris*. It is, of course, impossible to form a safe judgment upon a single specimen, and I can only say, that if a full series should show constant differences from *Fulvicosta*, and no connecting links be found, I should be inclined to concede the distinctness of this form.

This is one of those cases where it is much easier to see a difference than to describe it. Dr. Packard, however, who described *Vestalis*, wrote to me that he now considered his types to be only small specimens of *Fulvicosta*.

Mr. Smith advanced the opinion that this was the form given by Walker as *Conscita* ♀ instead of *Fulvicosta* as generally supposed; but as I regarded this as extremely improbable, I took a life-size photograph of my specimen and sent it to Mr. A. G. Butler, who wrote: "The small form is unknown to me, though I have seen an example of *Euchætes collaris*, under the name of *vestalis*." Mr. Smith also disagreed with me in regard to my citing his name *Lactata* as a synonym of *Conscita* Walk., and argued that *Conscita* ♂ = *Lactata* Smith, *Conscita* ♂ var. b. = *Fulvicosta* Clem. and *Conscita* ♀ = *Vestalis*, and argued that such confusion should militate against Walker's name being retained.

Mr. Walker's errors were no doubt great, especially his placing *Conscita* in a wrong genus; but from what Mr. Butler wrote in reference to the small *Vestalis*, I do not believe that Walker had that form before him at all. His only mistake, after the generic one, was in taking *Fulvicosta*, which had already been described by Clemens, to be the ♀ of *Conscita*, and this, apart from the creation of a partial synonym, was not so very dreadful, seeing that such a relationship would only imply a sexual variation similar to that between the ♂ and ♀ of *Leucarctia Acræa*. I, therefore, maintain my position as to the validity of Walker's name for this form, whether it be a species or only a variety, and in this I am supported by Mr. Butler, who wrote to me as follows: "There can be no question that if *conscita* is a good species (which I do not believe it to be), the first and larger part of Walker's description applies to it, and the mere fact of his referring the wrong female to it will not invalidate that description any more than if Walker had described the male only. Smith's name has not a leg to stand on." Mr. Smith further urged that I was not consistent, and that if his name *Lactata* fell before *Conscita* Walk., my name *Confusa* would

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have to give way to *Reversa* Stretch, and added, "I scarcely expect Mr. Lyman's adhesion to this theory." Probably not, but certainly not from the idea which he would seem to imply, as I trust I am not so petty as to allow any desire to have my own name stand, to warp my judgment as to what would be right in the premises.

Mr. Smith claimed that Mr. Stretch's name *Reversa* included *Confusa* as well as *Suffusa* and *Contigua*. I doubt this very much, but let it be assumed that it did, what follows? This is Mr. Smith's reasoning; *Contigua* had priority for one part of Stretch's description, "I separated *suffusa*, and the name stands for the remaining part, viz., *confusa* Lyman, which would remain only as a synonym of *reversa*." This I consider, and I trust Mr. Smith will forgive me for saying it, absolute nonsense, though unlike Mr. Smith's friend at the New York meeting, without any profane adjective.

What Mr. Smith did subsequently to Mr. Stretch's description could hardly affect the application of that name unless he had pointed out that the name *Reversa* covered several distinct species, and proposed that it should be limited to one of them, and then proceeded to give a new name to any other undescribed form.

Mr. Smith did not do this, and naturally so, as he thought, the name *Reversa* included *Contigua*, *Lecontei*, and the form which he undertook to describe as *Suffusa*. He thus proceeded to give a new name to what he considered the only previously undescribed species included by Mr. Stretch in his description. Certainly the greater part of the description of *Reversa* applies to *Suffusa;* Mr. Stretch, especially, saying that the markings "are exactly as in *Clymene*," and Mr. Smith, himself, acknowledged this to me. I, therefore, think that if the name *Reversa* is to stand, it must be for *Suffusa*, and not for the form which may possibly have been referred to in the following bracketed eight words of a sixteen line description: "The basal patch is triangular, (sometimes divided by a narrow, basal brown brand)."

I think, however, that as the first half of the description was evidently intended to cover *Contigua*, which Mr. Stretch appears to have considered the stem form, the name should be ignored, except as a synonym, and Mr. Butler wrote that he agreed with me on this point. Mr. Grote, on the contrary, wrote that *Reversa* should stand with *Suffusa* as a synonym.

Mr. Butler found fault with both Mr. Smith and me for using the

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name *Callimorpha* for these moths, writing as follows:—"I have strongly objected to the use of this generic name for this group on the following grounds, viz.:—1. The type of *Callimorpha* is *C. jacobææ*, a European *Lithosiid.* 2. There is already a generic name—*Haploa* Hübn.—for the North American representatives of *Hypercompa.* I have pointed out to Smith that there are structural differences between *Hypercompa* and *Haploa*, and although these characters are slight in themselves, I am of the opinion that, taken in conjunction with the utterly different aspect and style of coloration of the species, they should be regarded as sufficient."

Mr. Smith, it will be remembered, in his paper in the Proc. Nat. Museum, '87, 23, held that these "structural differences" were too slight to warrant such a separation, and affirmed, besides, that they were not constant, and for myself I may say, as I wrote to Mr. Butler, that I am not in a position to decide the question satisfactorily, even to myself, and so prefer to leave it to the authorities.

Mr. Grote, in two short communications to the CANADIAN ENTOMOLOGIST, while complimenting me on my plate and on my sorting out of the moths, insisted that my work was not original, and that these forms could not be regarded as distinct until they have been proved so by breeding from the egg.

I am not greatly concerned as to whether my humble work in this department is "original" or not. I contend that it is at least useful, but if the description of a form as a new species is not original, what is to be said of Mr. Grote's own work in the same direction? As to the argument about breeding from the egg, which has also been urged in letters by others, I repudiate it as unscientific and impracticable. If no one was to be permitted to describe a species as new until he had proved it to be such by breeding from the egg, there would long ago have been a complete block in the study of North American entomology, and there would not have been so many specific designations followed by the honoured name of Mr. Grote. Besides, it is not such a long time since a very distinguished entomologist described as a new species a form which he had "established on a sure foundation by breeding from the egg," and which shortly afterwards turned out, upon further breeding, to be only a previously named form of a well known polymorphic species. It is, therefore, difficult to say how much breeding would have to be done before these doubting Thomases could be convinced. I may say, however, that

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I held back my paper for several years in the hope of being able to breed the two forms, *Lecontei* and *Confusa*, side by side, but the appearance of such a muddle as the description of *Reversa* Stretch decided me to publish the results of my studies, so far as they had gone, with as little delay as possible.

Dr. Packard wrote that he could not believe in the distinctness of these species, and that Mr. Otto Seifert had bred a good many forms and considered them varieties of *Lecontei*. I immediately wrote to Mr. Seifert to ask for particulars of this most important information, and received an answer in which he said:—"Dr. Packard must have misunderstood me in saying I reared those *Callimorphas*. Showing the doctor quite a number of this insect in great variety I told him they had been caught (by Mr. Putnam Cramer) near Troy, N. Y., in July, all at the same spot." Finally, Dr. Lintner wrote very guardedly that *C. contigua* at least seemed distinct.

It would thus seem that these unfortunate moths, having got the reputation of all belonging to one species, it is impossible to get people to accept the idea that they may really be distinct species, although they are quite ready to accept as such any apparently new form of such difficult genera as *Colias*, *Argynnis* or *Catocala*, even when the difference is so slight as to be hardly perceptible.

I consider the *Callimorphas* far more distinct and more easily separated than the species of very many genera of butterflies and moths which could be named in addition to those referred to above. I have seen in all at least two hundred specimens, and until very recently and since the publication of my paper, I had never seen one that I could not unhesitatingly place at sight. The exception was in the case of a few specimens in the collection of Dr. Bethune, which seemed to indicate a possible linking of the two forms, *Confusa* and *Suffusa*, and I am prepared to admit that possibly these two forms may turn out to be northern and southern varieties of one species, though Mr. Smith disagrees with me strongly on this point.

I hold, however, very strongly with Mr. W. H. Edwards that whenever a form is distinctly and easily separable from previously named species, it is entitled to be treated as a good species, and to be given a specific name until it is proved to be only a variety by breeding, and that in such a case the name should be retained as a varietal name; but with regard to this breeding from the egg, I would point out that the making of these

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experiments is just as incumbent upon those who deny as upon those who assert the validity of these specific distinctions.

For myself, I care very little whether entomologists acknowledge that these moths belong to distinct species or not, if they will only regard them as distinct forms or varieties. No good can possibly come from lumping such forms as *Lecontei*, *Contigua*, *Confusa*, *Suffusa* and *Fulvicosta* under one name. Let these names be used if only as varietal names, in order that we may know what writers on the subject refer to, and learn something of the distribution of these interesting forms. If this is done, and those who have the opportunity and time will breed them and publish the results of their experiments, I shall be quite content, and shall have no fear of the correctness of my views being disproved, but even if the results should controvert my belief, I shall be quite satisfied so long as the truth is established.

NOTE ON THE PREDATORY HABITS OF CHÆTOPSIS ÆNEA (WIED).

REV. THOMAS W. FYLES, SOUTH QUEBEC.

In the beginning of July last I discovered in a bed of *Typha latifolia*, in the neighborhood of Montreal, a large number of the larvæ of *Arzama obliquata*. I have visited the spot repeatedly, and have had the larvæ under daily observation. One remarkable circumstance concerning them is that they are liable to attacks from the maggots of a fly belonging to the Ortalidæ, viz.:—The *Chætopsis ænea* of Wiedeman, the *Ortalis trifasciata* of Say. I found that larvæ, in the proportion of about one in every six, had been overcome by these maggots. Some of the victims were quite dead; some were still writhing. As many as twenty maggots were feeding on one caterpillar, draining away its juices. They were of the usual form, pointed at one end and truncated at the other. When mature, their length was about seven-sixteenths of an inch. I raised a great number of them, feeding them upon injured *obliquata* larvæ. The pupal stage lasted about ten days; and all through August the flies continued to make their appearance. They are very beautiful. The head is white; the eyes are dark brown; the body is green and glossy; and the legs, antennæ and mouth-organs are brownish yellow. The wings are whitish and hyaline; they have black tips and two transverse black bars, the hinder of which touches the black tips at the costal edge. I am indebted to Dr. Hagen for the identification of the species.

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PREPARATORY STAGES OF PYRAMEIS CARYE, HÜBNER.

BY HARRISON G. DYAR.

The eggs are deposited by the butterflies, singly, on the upper surface of the leaves of the food-plant, the Malva. They are nearly cylindrical, but thicker in the middle, the base and top quite flat, and rather abruptly rounded. The longitudinal ribs project beyond the summit; color green, of a slightly bluer tint that the leaves. Length 7 mm.

FIRST LARVAL STAGE.—Head, cervical spot, anal plates, and alternating row of eight black dots per segment and short hairs, all black. Body dark yellowish. Head without processes, smooth and shiny. The caterpillar spins a web on the surface of the leaf, beneath which it lives and eats the upper portions of the leaf. Length about 2 mm.

SECOND LARVAL STAGE.—Head black and hairy. Body pale purplish black; short spines bearing black hairs, arranged as in the mature larva, black, but the dorsal and sub-dorsal on joints six, eight and ten, yellow. Length 4 mm.

THIRD LARVAL STAGE.—As in the preceding stage, but the sides faintly mottled with yellow, and a geminate yellow dorsal stripe. Length 8 mm.

FOURTH LARVAL STAGE.—Head slightly cordate, bronzy black, with minute, yellow speckles and black hairs. Body purplish black, with small yellow spots, a geminate dorsal yellow line, irregular and interrupted, and a series of irregular supra-stigmatal and sub-stigmated spots. Spines black. Length about 15 mm.

FIFTH LARVAL STAGE.—Mature larva. Quite variable in appearance, but the markings are essentially the same. Head black, covered with many white hairs, and on the vertex about six orange elevated spots bearing black hairs. Body dull greenish and black mottled, varying in intensity of shade from black, through gray, to a dull dirty white, but usually light colored, thus distinguished from its ally, *Pyrameis cardui*. On the body are many orange or yellow spots, appearing to be irregularly placed, but they may be arranged as follows:—A row in sub-dorsal space, three contiguous lateral rows (in one example in which the spots were yellow, the central lateral row was orange), and a supra-stigmatal and sub-stigmatal row, all irregular. Spines black or white, or, in some, the anterior ones black, branched, and each tipped by a black hair. The spines are seven per segment on joints five to twelve (*i. e.*, dorsal, sub-dorsal, lateral and sub-stigmatal), none on joint two, four on joints three

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and four, and two on joint thirteen. The body is covered by many small elevated spots producing short white hairs. Venter greenish, mottled with black or brown. Length about 30 mm.

CHRYSALIS suspended by the cremaster, depressed behind the thorax, the thoracic process short and pointed, tapering anteriorly in a ridge, wing cases prominent, abdominal segments small and quickly rounded, cremaster flattened and hooked to the button of white silk, a pointed elevation at each eye, and at the base of the wing cases. Three rows of dorsal pointed elevations on the abdominal segments with two points on the thorax, touched with white, and two large and two small white spots in the depression behind the thorax. Color of chrysalis wood brown, minutely mottled with whitish or darker to black. The caterpillar forms itself a hollow in which it lives, by spinning up one or more leaves of the food-plant. The length of each stage is about four days, and the pupa state lasts about two weeks. In its early stages the insect cannot be distinguished from *Pyrameis cardui.*

Larvæ from Los Angeles Co., California.

BUTTERFLIES AT QU'APPELLE, ASSA.

BY HENRY SKINNER, M. D., PHILADELPHIA.

The following is a list of butterflies caught near Fort Qu'Appelle, Northwest Terr., by Mrs. Cora E. Rose and her two little sons. Mrs. Rose describes the locality as follows:—"Those sent were all caught within a radius of about half a mile, in the territory of Assiniboia, thirty miles north of an old Hudson Bay Post called Fort Qu'Appelle, and distant west from Winnipeg some three hundred and twenty-five miles; the only foliage is willow and poplar."

Papilo rutulus, Bdl.

Pieris protodice, Bdl.

Colias christina, Edws. A number of males and one female, the orange form.

Colias philodice, Godt.

Colias Scudderii, Reak.

Colias eurytheme, Bdl. A number of fine males and one female.

Lycena Scudderii, Edws. Male and female.

Chrysophanus helloides, Bdl. Male and female.

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Chrysophanus florus, Edws. Male and female.

Danais plexippus, Linn. One very peculiar looking male expanding only three and one-half inches and having the primaries produced apically in a remarkable manner.

Euptoieta clandia, Cram. This has previously been reported from N. W. Terr. by Geddes; all the books give it a much more southern range, Strecker giving it from Pennsylvania southward and Edwards's northernmost points being Quebec and California.

Argynnis lais, Edws.

Argynnis bellona, Fabr.

Melitea carlota, Reak.

Grapta progne, Cram.

Vanessa milberti, Godt.

Vanessa antiopa, Linn. The expanse is considerably less than in those found here (Phila.)

Pyrameis cardui, Linn.

Pyrameis huntera, Fabr.

Limenitis arthemis, Drury.

Erebia discoidalis, Kirby.

Erebia sine-ocellata, Nov. var.

This is a var. of *epipsodea*, Butler, which, I think, deserves characterization. It has the bright fulvous patch on the superior wings divided into four sections by the sub-costal and discoidal nervules. Above the third median nervure is a small fulvous patch separated from the rest. There are but two black dots on the fulvous, and the white dots, which in *epipsodea* make them ocelli, are wanting. The underside of the superior wings is practically the same as the upper. Described from two specimens, one from Fort Qu'Appelle and the other in the Coll. Am. Ent. Soc., locality unknown. The Fort Qu'Appelle specimen is very much darker than *epipsodea* usually is. *Epipsodea* is quite a variable species, individuals differing in the size, colour and number of the ocelli, also in the extent and number of the fulvous patches. One marked specimen having four white pupilled ocelli.

Chionobas varuna, Edws.

Satyrus, var. *boopis*, Behr.

Satyrus, form *olympus*, Edws. Three specimens. They do not agree entirely with *olympus*, but I did not think they deserved a new name.

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Cœnonympha typhon, Rott. If this is not a variety of the European form it is most likely a new species. Two examples only.

Pamphila Manitoba, Scud.

Pamphila cernes, Bdl.-Lec.

Thymelicus garita, Reak.

Nisoniades icelus, Lint.

CORRESPONDENCE.

A RARE MOTH.

Dear Sir: Allow me to record the capture, in Canada, of the rare moth *Thysania (Erebus) Zenobia*, Cramer.

On the evening of Aug. 20th, 1888, while sugaring for Catocala in the woods near this village, I came upon the strange visitor. He was sitting, with wings spread, sipping my bait, and was evidently more at ease than I. The sensation which a hunter is said to experience on sighting his first deer came upon me, for I was unprepared for such an encounter. However, the monster was taken.

By a careful comparison of my specimen with the descriptions and with Drury's figure of T. Zenobia, and by submitting it to three different Entomologists of eminence, all of whom concur in my opinion, I have placed its identity beyond a doubt.

The only reference, as far as I can find, heretofore published of its occurrence in North America is in the following foot-note in Prof. Grote's Check List of Noctuidæ North of Mexico, P. II., page 43 (1876), viz.:— "Professor Riley informs me that this species occurred at Davenport."

In Vol. XVIII., page 236, of this Journal, Prof. Grote mentions Thysania Zenobia as one of the "species which are probably summer birds of passage from the West Indies and South America, following the Gulf Stream, or aided by prevailing winds."

Drury gives Jamaica as its habitat.

It is hard to believe that so frail a creature as an insect, though strong in flight, could have flown two thousand miles, but the ragged condition of the margins of the primaries in my insect, while all the other parts are apparently quite fresh, is evidence of its having fanned many miles of atmosphere.

A. H. KILMAN, Ridgeway, Ont.

Mailed December 7th.

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INDEX TO VOLUME XXI.

Aaron, E. M., articles by, 126, 145.
Aleutian Islands, new species of Tineidæ from, 27.
American Lackey Moth, 74.
Annual Meeting Entomological Club A. A. A. S., 131.
Annual Meeting Entomological Society of Ontario, 181.
Ants herding caterpillars, 132.
Apple tree tent caterpillar, 74.
Arctiadæ of temperate North America, preliminary catalogue of, 169, 193, 213.
Arge Galathea, preparatory stages of, 61, 81.
Ashmead, W. H., article by, 37.
Association of Official Economic Entomologists, 166, 219.
Audubon, monument to, 80.

Agasphærops nigra, 33.
Agrotis saucia, 118.
" scandens, 118.
" subgothica, 118.
Aletia argillacea, 22.
Amalopota, n. gen., 176.
" *Uhleri*, n. sp., 178.
Ameria Texana, 161.
Amphipyra pyramidoides, 230.
" tragopogonis, 230.
Amphotis Ulkei, 106.
Ancyloxypha numitor, 160.
Anthocharis genutia, 129.
Apatela felina, 36.
" lepusculina, 36.
Aphodius marginatus, 32.
Arctia achaia, 35.
" Behrii, 35.
" geneura, 162.
" phylira, 60.
" pinorum, 163.
" *Shastaensis*, n. sp., 162.
Argynnis Cybele, 130.
" Idalia, 129.
" Myrina, 130.
Arzama obliquata, 39, 78, 79, 99, 160, 226, 236.
" vulnifica, 226.
Ataenius Wenzeli, 103.

Bethune, C. J. S., articles by, 100, 181.
Beutenmuller, W., articles by, 27, 160.
Bombycidæ, notes on, 28.
Book notice, 100.
Brehme, H. H., article by, 78.
Butterflies at Qu'Appelle, 238.
" captured at Montreal, 120.
" catching, by means of decoys, 110.
" classification of, 205.
" flock of, 38.
" length of life in, 49.
" of Philadelphia, 126, 145.
" of Prairies and Rocky Mountains, 57.
Butterfly, an early, 120.

Bembidium 4-maculatum, 107.
Biotus formicarius, 105.
Blaps similis, 101.
Bledius basalis, 30.
" politus, 30.
Bruchomorpha oculata, 7.

California moths, notes on, 35.
" some moths from, 161.
Callimorphas, the North American, 231.
Carterocephalus mandan, preparatory stages of, 113.
Cerathosia, Mr. Smith on, 37.
Chætopsis aenea, predatory habits of, 236.
Chionobas jutta, further notes on, 12, 67.
Cicindela, notes on, 29, 104.
Citation of localities, 46.
Clarkson F., article by, 28.
Clivina, notes on, 30.
Clothes beetle, a new, 187.
Cockerell, T. D. A., articles by, 20, 46, 60, 140, 220.
Coleoptera, additions to list of Canadian, 108, 134.
Coleoptera, new to Colorado, 20.
" notes on, 29, 101.
Colias Meadii, preparatory stages of, 41.
Cook, A. J., article by, 187.
Corrections and additions to previous papers, Hamilton, 101.
Currant saw-fly, the imported, 150.
Cut-worms, 117.
Calosoma calidum, 119.
Catocala relicta, 122.

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Ceratocampa regalis, 101.
Cerostoma Aleutianella, n. sp., 27.
" *dubiosella*, n. sp., 27.
Chionobas, 12, 63, 67.
" Macounii, 160.
" semidea, 67.
Chlænius Pennsylvanicus, 30.
Cicindela lepida, 104.
Clisiocampa Americana, 74
Cloeotus aphodioides, 104.
Colias Boothii, 60.
" cæsonia, 43.
" " n. var. *rosa*, 45.
" chione, 59.
" eurytheme, 60, 238.
Conosoma pubescens, 107.
Conotrachelus naso, 34.
Cremastochilus Knochii, 106, 140.
Cychrus Lecontei, 30.
Cyphon padi, 108.

Datana major, larva of, 34.
Dawson, P. M., article by, 179.
Denton, S. W., articles by, 38, 110, 164.
Derbidæ, observations on some northern, 156, 176.
Droves of Lycænid caterpillars herded by ants, 132.
Dyar, H. G., articles by, 34, 77, 137, 209, 237.
Dyschirius, notes on, 29.

Danais archippus, 19.
" plexippus, 239.
Dermestes Frischii, 101.
" murinus, 101.
Dicerca prolongata, 105.

Edwards, W. H., articles by, 41, 61, 81.
Elliott, R., article by, 120.
Entomological Club A. A. A. S., meeting of, 131.
Entomological Society of Ontario, meeting of, 181.
Euplexia lucipara, preparatory stages of, 137.

Emphylus Americanus, 106.
Epitragus arundinis, 103.
Erebia epipsodea, 64, 239.
" " n. var., *sine-ocellata*, 239.
" magdalena, 67.
Erebus Zenobia, 240.
Euparia castanea, 106.
Euphoria hirtipes, 106.
Euptoieta Claudia, 239.

Farmers' own insecticide, 220.
Fletcher, J., articles by, 15, 74, 113, 117, 150, 201.
French, G. H., articles by, 25, 35, 161, 210, 221.
Fyles, T. W., articles by, 12, 17, 220, 236.

Geddes, G., articles by, 57, 59.
Gortyna, notes on genus, 139.
Gosse, P. H., death of, 17.
Grote, A. R., articles by, 21, 37, 51, 121, 139, 154, 188, 205, 226.

Glæa inulta, 153.
Gnophaela vermiculata, 174, 220.
Grapta j-album, 148, 164, 179.

Hagen, H. A., articles by, 53, 71.
Hamilton, J., articles by, 29, 101.
Harrington, W. H., articles by, 95, 141.
Hemiptera from Muskoka Lake District, 1.
Howard, L. O., articles by, 13, 59.

Hadena arctica, 118.
Harpalus dichrous, 31.
" vulpeculus, 31.
Harpiphorus varipictus, n. sp., 96.
Hesperia unna, 149.
Hymenorus obscurus, 107.
" rufipes 107.
Hypocoprus formicetorum, 106.

Insecticide, Farmer's own, 220.
Insects injurious to fruits, Saunders, 100.

Ibalia maculipennis, 141.
Icerya Purchasi, 182.
Ips fasciatus, 103.

Johnson, J., article by, 79.

Junonia cænia, 145.

Kellicott, D. S., article by, 39.
Kent Scientific Institute, 80.
Kilman, A. H., articles by, 108, 134, 240.

Larvæ, descriptions of, 34, 41, 61, 77, 113, 137, 160, 164, 179, 209, 210, 237.
Lepidoptera, additions to list of Canadian, 153.
Lepidopterous Faunæ of Europe and North America, 21.
Leptarctia Californiæ, preparatory stages of, 210, 221.
Leptura, notes on, 32, 108.
Lyman, H. H., article by, 231.

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Lasioderma serricorne, 187.
Lebia vivida, 30.
Leptarctia Californiæ, 210, 221.
" " n. var. *Albifascia*, 222.
" " var. Boisduvallii, 222.
" " var. Decia, 224.
" " var. Dimidiata, 222.
" " var. Fulvofasciata, 223
" " var. Latifasciata, 223.
" " var. Lena, 224.
" " n. var. *Occidentalis*, 223.
" " var. Stretchii, 222.
" " n. var. *Wrightii*, 224.
Leptura exigua, 33.
" hæmatites, 32, 108.
" nana, 108.
" subargentata, 33.
" zebra, 33.
Ligyrus relictus, 32.
Limacodes inornata, 77.
Limulodes paradoxus, 105.
Lixus concavus, 103.

McNeill, J., article by, 43.
Moffat, J. A., articles by, 19, 60, 99, 153.
Moth, a rare, 240.
Moths from Texas, Arizona and California, 161.
Muskoka Lake District, Hemiptera from, 1
Myrmophile, a new, 140.
Myrmophilous Coleoptera, 105, 140.

Macrobasis unicolor, 103.
Macrophya propinqua, n. sp. 97.
Meligethes aeneus, 107.
Myrmechixenis latridioides, 106.

Noctuidæ of America and Europe, 121, 154, 100, 226.
Notes, 79.

Nathalis Iole, 60.
Nematus Erichsonii, 152.
" *ocreatus*, n. sp. 95.
" ribesii, 150.
Neonympha areolatus, 25.
" *Mitchellii*, n. sp., 25.

Ochria, note on genus, 139.

Œneis, 63.
Ortalis trifasciata, 236.
Otiocerus Coquerbertii, 159.
" Degeerii, 159.
" Signoreti, 176.
" Stollii, 159.
" Wolfii, 176.

Popular and Economic Entomology, 15. 74, 117, 150, 201.
Prairies, collecting in the, 57.
Pyrameis Carye, preparatory stages of, 237.

Pamphila Peckius, 147.
Papilio Asterias, n. var. *alunata*, 127.
" Glaucus, 128.
" Philenor, 127.
" Rutulus, 111, 238.
" Turnus, 111, 128, 201.
Phalangodes robusta, 140.
Phymatocera nigra, n. sp., 96.
Piazorhinus pictus, 104.
Pieris Ilaire, 39.
" rapæ, n. var., *immaculata*, 128.
Pityophagus rufipennis, 31.
" verticalis, 31.
Platysamia Cecropia, 28.
Plusia Arizonæ, 161.
" formosa, 124.
" Lenzii, 161.
" thyatiroides, 124.
Pocadius helvolus, 31.
Ptenidium evanescens, 105.
Pterostichus adoxus, 102.
" coracinus, 102.
" femoralis, 102.
" Hamiltoni, 102.
" lachrymosus, 102.
" patruelis, 102.
" tartaricus, 102.
" unicolor, 102.
" vinctus, 102.
Ptinus bimaculatus, 135.

Rhyssematus scaber, habits of, 30.
Rileya, final word about, 37.
" one word more about, 13, 59.

Satyrinæ, notes on certain, 61, 81.
Saunders, insects injurious to fruits, 100.
Scudder, S. H., article by, 49.
Skinner, H., articles by, 126, 145, 238.
Smith, J. B., articles by, 169, 193, 213.
Specific names, 51.
State Entomologist of New Jersey, 79.

Samia Cynthia, 28.
Saperda concolor, 105.
" Fayi, 104.
Soronia Ulkei, 106.
Stenolophus conjunctus, 31.

Tenthredinidæ, n. sp. of Canadian, 95.
Thyatira pudens, larva of, 209.
Tiger Swallow-tail Butterfly, 201.

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Tineidæ from the Aleutian Islands, new species of, 27.
Trenholme, E. C., article by, 120.

Tachinus pallipes, 107.
Tachycellus Kirbyi, 31.
Tachyporus brunneus, 107.
" scitulus, 107.
Tarucus theophrastus, 132.
Taxonus rufipes, n. sp., 97.
Tenthredo semicornis, n. sp., 98.
Tenthredopsis Evansii, n. sp., 98.
Thamnotettix eburata, n. sp., 10.
Thysania Zenobia, 40, 240.
Trichopteryx fasciicularis, 105.
Trogoderma ornata, 101.

Van Duzee, E. P., articles by, 1, 39, 158, 176.

Winter collecting, 15.
Wylly, Mrs., article by, 132.

Zimmermann, Dr. Christian, memoir of, 53, 71.

ERRATA.—Page 159, line 4 from bottom, for "*Amphixepa*" read "*Ampiscepa.*"
" 161, line 21 from bottom, for "Arizona" read "Arizonæ."
" 162, " 7 from top, for "in" read "is."
" 162, " 11 " " " "boat-shaped" read "boot-shaped."
" 162 and 163, for "Genura" read "Geneura" wherever it occurs.
" 178, line 3 from top, for "*Hucita*" read "*Helcita.*"
" 182, line 14 from top, for "Mr. Percy Crawford" read "Mr. Frazer S. Crawford."
" 182, line 26 from top, for "Colonel Robins" read "Colonel Dobbins."
" 209, line 4 from bottom, for "Endamus" read "Eudamus."
" 220, line 3 from top, for "*Phytolacca decandra*" read "*Veratrum viride.*"

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The Canadian Entomologist.

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BALANINUS—ITS FOOD HABITS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

All the described species of *Balaninus* inhabiting America north of Mexico when larvæ live in the fruit (nuts and acorns) of the various species of *Quercus*, *Castanea*, *Corylus* and perhaps *Fagus* of the order *Cupuliferæ*, and *Carya* of the *Juglandaceæ*. Acorns, somewhat largely used in this country in the arts and in the manufacture of certain dietetics, are mostly imported, the native production being rendered almost worthless by these larvæ; and our chestnuts as soon as collected must be kiln-dried or otherwise treated, which renders them greatly inferior to those of foreign countries. *Balaninus* has not yet received any attention from an economic standpoint, but from the above would seem deserving of some consideration in that direction. The systematic separation of the species has only been effected recently and definite characters furnished for their recognition. Say probably had all the now described species before him, and excluding *proboscoideus*, included them in his *rectus* and *nasicus*. The failure of Say, one of the clearest of describers, to make his species recognizable by description, is suggestive of the absence of points of saliency, and has been the source of much confusion in our literature, some of which is evidenced in the earlier volumes of the CANADIAN ENTOMOLOGIST.

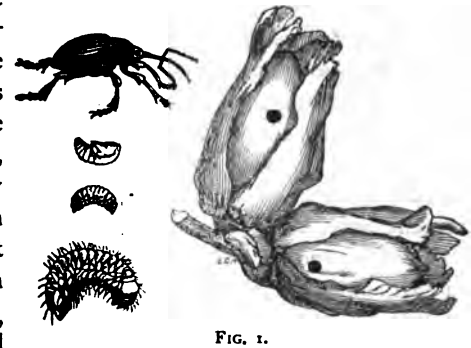

FIG. 1.

NOTE.—Figure 1, drawn by Miss Ormerod, represents a European species, *Balaninus nucum* Linn., which feeds upon filberts. It conveys a good idea of the characteristic forms of the genus.

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The separation of *Balaninus* into species with valid characters was effected by Dr. Geo. H. Horn in a monograph of the genus in 1873 (Proc. Am. Phil. Soc., Phil., xiii., 457, et. seq.). The species assigned to Say's names were determined by the descriptions of Gyllenhal from types sent him by Say, and the assignment has not been questioned —*Requiat.* To the old species, *caryatrypes*, *rectus*, *nasicus* and *uniformis* (Lec., 1857), were added *caryæ* and *quercus;* and in 1885, Mr. F. Blanchard (Bul. Brook. Ent. Soc., vii., 107,) described *obtusus*. The systematic part of the work has been well done, yet the accurate separation of a mixed collection requires much care and considerable practice, and cannot be effected by mere inspection. To determine whether each species has a preference for some particular species of acorn or nut, or whether there is an absence of choice, I instituted some experiments in rearing them, the results of which I propose to give, without, however, claiming them as finalities. In the year 1888, larvæ from hazelnuts *(Corylus Americana* and *C. rostrata)* collected here by myself; from chestnuts *(Castanea vesca)* purchased in the market, collected in many places in the surrounding country; and from acorns of white oak *(Quercus alba)*, chestnut oak *(Q. monticola)*, black oak *(Q. tinctoria)*, red oak *(Q. rubra)*, scarlet oak *(Q. coccinea)* and *Q. imbricaria*, all collected in the same woods, were placed in separate breeding jars, which were kept in my office till the present time, the winter temperature not falling below 40°, nor that of summer exceeding 65°. This was evidently an unnatural condition, and in part accounts for the irregular developement of the most of the species, and the not inconsiderable number of larvæ that go over till the next year.

B. proboscoideus Fab. *(caryatrypes* Bohm.).—This species was bred only from chestnuts. The first example appeared June 25 and the last July 12—a period corresponding with the blooming of the chestnut here. At the time of blossoming the chestnuts are fully formed, and larger than might be supposed. The envelope or burr is over three-fourths of an inch in height, soft, and covered with distant tubercles from which the prickles afterwards develope. The ♀ *proboscoideus* at this time deposits her eggs and dies, her life being limited to a week or two at the most—none being found after the bloom has fallen. About eighty examples were reared, the sexes being numerically equal. They were uniform in size and color, and beautifully variegated with fuscous lines and spots interspersed among the dense clothing of ochreous scales on the thorax and elytra. I have, how-

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ever, seen in collections examples entirely ochreous. The ♀ beak varies in length from one and one-quarter to about twice that of the body. The character distinguishing it from all the other species is that the first joint of the funicle of the antenna is shorter than the second.

B. rectus Say.—This, like the preceding, was bred from chestnuts only. The first example appeared June 28, and others followed very sparingly, and till date (Oct. 1st) ninety-five examples have been taken. Pupæ in various stages and many larvæ are yet in the earth, and will no doubt go over till next year. The conditions in breeding are evidently unnatural, but why *proboscoideus* was not influenced equally (being in the same vessel) seems strange. In nature the beetles would certainly have been on hand for the chestnuts when in bloom, at which time they are taken by beating the blossoms. Though only raised by me from chestnuts, this species may breed here in acorns, as I took a ♀ May 15th with *nasicus* by beating. Dr. Levette, of Indiana, once sent me a set raised by him from Arizona acorns, the beetles appearing in December of the year in which the acorns grew, which in no way differ from those bred from chestnuts. The individuals vary greatly in size (4 to 7 mm.) and in colour. The general colour of the scales and hair is light brown above, paler below; the thorax has a dark brown discal stripe, limited at the sides and divided longitudinally by a pale yellow line, the elytra being interspersed in various ways with markings of the same colour. I have never seen one entirely unicolorous. The beak of the ♀ is very long and slender, equalling or even exceeding that of the preceding species in proportion to the size; this and the form of the thorax, which is long and conical, will distinguish the ♀ from all others. The ♂ has a shorter thorax, but it is still narrowed anteriorly; this, with small femoral tooth, oval elytra rapidly narrowed from base, and a yellowish or brownish spot of condensed scales on each side of the central line of the metasternum (occasionally obsolete), will, with practice, distinguish it.

B. quercus Horn.—This species was bred from all the species of acorns mentioned except the annuals (white and chestnut oak). The first example appeared June 10th, and till August 1st about one hundred and sixty were observed; scattering ones have since occurred from time to time, and now the earth contains a few pupæ and larvæ, but not so many as in the case of *rectus*. This species seems to have no preference for any of the kinds of acorns mentioned, being reared from each in about

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equal numbers. Whether development was retarded or deranged by indoor raising is uncertain, as I never took even a single specimen by beating, though evidently excessively abundant. The individuals vary from 5 to 9.5 mm. in length. The general color of all bred was ochreous brown, nearly uniform on the thorax and variously interspersed on the elytra with small yellowish spots. My specimens from New Jersey and Florida are entirely cinereous, mottled on the elytra with darker spots, and look as if belonging to a different species. The ♂ of this species is distinguished from that of all the others by a very unique and striking character, viz., the pygidium deeply concave, with the cavity smooth and surrounded by an acute rim, fimbriated with long silken hairs. The beak of the ♀ does not equal in length that of either of the two preceding species, but is, in most cases, as long at least as the body; the posterior margin of the hind femoral tooth is oblique; the pygidium is very pilose and fimbriate, and the scape of the antennæ is short—about equal to the first two joints of the funicle (sometimes shorter and sometimes longer, the relative length of these parts not being a constant). The careful observance of these characters will readily separate it from any of its allies.

B. nasicus Say.—This species was bred abundantly from the acorns of the white and chestnut oaks, and six examples from those of the scarlet. The first example appeared June 1st, and one or two daily till July 6th, between which and the 16th about one hundred and fifty were observed, and scattering ones till the present writing (Oct. 1st). Some larvæ and pupæ are still in the earth. In nature, this species is taken here by beating from about the 10th of May till the last week in July in great abundance, and individuals occur till near October. The prevailing colour of the vestiture above is ochreous, variegated on the thorax and elytra more or less with brownish markings, many examples, however, are nearly uniform in colour, varying from pale ochreous to dark brown, and I have a specimen from Florida that might be called cinereous. The beak of the ♀ is about the length of the body in the majority of individuals, and in the remainder either longer or shorter in about equal numbers. The species may be distinguished at a glance from all others except *caryæ* by the larger posterior femoral tooth, the hind border of which meets the femur at a right angle, with no tendency to become sinuate or obtuse.

B. caryæ Horn.—This species has not been taken here, and was not

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bred, as I could not obtain last year any hickory nuts containing larvæ, but as more success was had this season I hope hereafter to make known whether *caryæ* will be developed. It is somewhat difficult to find infested hickory nuts, as comparatively few are attacked. The *Carya glabra* seems to be preferred, next the *C. alba* and *C. amara*, while *C. tomentosa* and *maxima* are nearly exempted. From one to eight larvæ will inhabit a single nut, their size not being affected by the number. Many of them never attempt to gnaw out of their bony habitation, but when full fed shrivel up and die. In size they equal the larvæ of *proboscoideus*. Some of the nuts are also depredated on by a lepidopterous larva, apparently the same as one of the four species I find in acorns. This is not an inquiline, but feeds on the kernel either with the *Balaninus*, or by itself, there being seemingly no place of entrance. Two other species inhabit the thick hulls of *tomentosa* and *alba* which I hope to rear. This species averages larger than *nasicus*, which it much resembles, but differs by the larger femoral teeth; the tibiæ more strongly mucronate at tip, and the narrow hair-like (not oval) scales below. The ♀ beak is rather longer; the last ventral more deeply impressed, and the antennal scape about equals four joints of the funicle. My specimens were bred by Dr. Levette, of Indiana, from *C. olivæformis*, Pecans.

B. uniformis Lec.—This species was bred from the acorns of all the biennials in about equal numbers, and three examples from those of the chestnut oak; forty-two specimens were taken in all—not nearly so numerous as *quercus* with which it was reared. The first example was seen June 21st, and none after August 1st. The individuals were very uniform in size (5.5 to 6.5 mm. in length) and color, being all clothed with cinereous pubescence of a scaly nature, and the elytral intervals variegated with darker spots. My specimens from Texas and New York are exactly similar. This is not the typical color. The species was described from examples taken at Sacramento, California, and at Steilacoom, Washington, which were "concolorous" and "densely fulvo-pubescent," but colour is of no value in the species of this genus. The nostrum of all the females seen was shorter than the body; the antennal scape short, about as long as the first two joints of the funicle. The femoral tooth in both sexes is comparatively small, with the posterior edge deeply sinuous. This and the foregoing ♀ characters will help to distinguish this species, but in case of doubt, reference in this, as in all other

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species, should be made to the two papers mentioned for more minute characters.

B. obtusus Blanch.—This species was bred from hazelnuts alone. The first example was seen June 25th, and the last July 20th. From about one-third pint of nuts 24 specimens were obtained, the size and colour of which were nearly uniform. Compared with *uniformis*, this species is of a more robust facies; the claw appendices are broader; the beak of both ♂ and ♀ is much thicker and black altogether, or at least to the insertion of the antennæ, the base being in both sexes punctured, and in the ♂ more or less striated. The scape of the antenna of the ♀ is equal in length to that of three of the succeeding joints of the funicle combined; the femoral tooth is stronger than in *uniformis*, with the posterior edge oblique and less sinuate; the last ventral of the ♀ is rounded at tip and strongly pubescent; not at all impressed as in the preceding. The differences are somewhat comparative, but in the absence of more salient points, this is about all that can be done by description. This species in nature seems to be short lived, as I have never obtained it by beating previous to June 20th, nor after July 15th; till about this time the shell of the nut is soft and easily pierced; the puncture for the egg is made directly through the involucre and shell into the kernel near its base.

There is a nondescript form of *Balaninus* which I did not raise, of which about thirty examples were taken in June with *nasicus* in beating oak by Mr. Klages in Westmoreland County, and about a dozen others were received from Mr. S. Auxer, of Lancaster, Pa. It seems to be allied to *obtusus*, *uniformis* and *nasicus*, but cannot well be assigned to either. The form, density of vestiture, shape of the elytra and colour are the same as in *nasicus*, but the femoral tooth is much smaller and oblique, and the beak of the ♀ does not often exceed two-thirds the length of the body; this last character groups it with *uniformis* and *obtusus*, with the former of which it agrees in having the claw appendices acute, but differs by having the beak thickened and punctured at base in both sexes like in *obtusus*, by the longer antennal scape of the ♀, which is equal to at least the three first joints of the funicle (in *uniformis* to joints one and two), and by the denser covering of hair-like scales and less robust form of body; the femoral tooth is a little larger, oblique and less sinuate posteriorly. From *obtusus* it differs by the claw appendages being acute

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(not obtuse), its much less robust and posteriorly attenuated form, and by the more or less impressed last ventral segment of the ♀; *obtusus* is much more sparsely clothed. There are other minor differences, but the above suffice to show that it is not in harmony with any of the species mentioned. From a mixed lot of *nasicus* its separation requires an examination of the femoral tooth in every individual, but mixed with the other two, simple inspection will suffice in the most of cases.

It is quite probable other species of *Balaninus* remain to be discovered, only one species of which is known from the Pacific Coast. A very pleasant and certain way to determine this would be for collectors everywhere to rear them from nuts and acorns and publish the results. Other modes of collecting are not to be relied on, as for example, in twenty years collecting here I only took *nasicus* and *obtusus*, and in chestnut time *rectus*, but all this time all the other species (*caryæ* probably included) were sufficiently abundant.

DISTRIBUTION.

B. proboscoideus.—Middle States westward, Horn; Massachusetts, Blanchard; Tennessee, Illinois, District of Columbia, Ulke; Ohio, West Virginia, Pennsylvania.

B. rectus.—Middle and Southern States, Horn; Arizona, Smith; District of Columbia, Virginia, Ulke; Canada, New York, Massachusetts, Pennsylvania, Ohio, West Virginia.

B. quercus.—Illinois, District of Columbia, Ulke; New York, New Jersey, Pennsylvania, West Virginia, Ohio.

B. nasicus.—Canada to Georgia, and westward to Colorado and New Mexico.

B. caryæ.—Illinois, Ulke; Indiana, Levette; Kansas (Douglas Co.), Snow; Pennsylvania, Klages.

B. uniformis.—Canada to Florida, from the Atlantic to the Pacific.

B. obtusus.—Massachusetts, New Hampshire, Blanchard; Texas, Nebraska, Horn; Ohio, Pennsylvania, West Virginia.

Undescribed form.—Massachusetts, North Carolina, Blanchard; Pennsylvania (Lancaster Co., Auxer; Westmoreland Co., Klages).

Balaninus has a single parasite common to all the species, except that it was not reared from *obtusus;* the larva was not observed while living in that of *Balaninus*, but it forms a tough papery cocoon so thin

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and transparent that the enclosed larva and pupa can be observed. These cocoons occupy the cell formed by the *Balaninus*, and are shaped much like those of the large ants, but much larger. The imago is quite graceful, the ♀ ovipositor being proportionately as long as in *Rhyssa*. Mr. Cresson would have described this species under the specific name *balanini*, but was anticipated by Mr. W. H. Ashmead, who probably describes the same thing under the name *Urosigalphus armatus* (Proc. U. S. Nat. Museum, 1888, p. 637, but only issued Oct. 1st, 1889). Besides the larvæ of *Balaninus*, those of at least four lepidopters infest acorns, two of which seem to enter by the holes made by the *Balaninus* in leaving, and live on the debris within. The other two are found with the *Balaninus* larvæ, one of them feeding on the refuse made by them, but the other depredates on the substance of the acorn, and is sometimes found in acorns by itself; it pupates in the earth without forming a cocoon. The others formed thin papery cocoons against the sides of the jars in which they were confined. I failed to obtain their names, the gentlemen of whom inquiries were made being seemingly unacquainted with these forms.

SUMMARY.

B. proboscoideus is so far only known to depredate on chestnuts.

B. rectus has been reared here from chestnuts only, but elsewhere from Arizona acorns.

B. quercus was reared in about equal numbers from the acorns of all the biennial fruiting oaks mentioned.

B. nasicus prefers the acorns of the annual fruiting oaks (white and chestnut), but depredates sparingly on those of biennials.

B. caryæ has been reared from pecan hickory nuts elsewhere, and many larvæ from nuts grown here are now in rearing and will almost certainly develope this species.

B. uniformis prefers the acorns of biennials, but will depredate occasionally on those of annuals (chestnut oak).

B. obtusus is only known to depredate on hazel nuts.

The indescript form probably lives in acorns in the larva state, but has not been reared.

Obs.—The acorns of all species were collected from oaks growing in the same place promiscuously, so that the parent beetles evidently discriminated in their choice.

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 219, Volume xxi.)

Genus ARCTIA Schrank.

1802—Schrank, Fauna Boica II., 2, 152.

The typical genus of the family—a general favorite with collectors and the source of a good deal of worry and uncertainty to describers. I have seen very large series of specimens of many species, and have seen nearly all the species. From a rather careful study of the species I can see no reason why they should not be as easily recognizable or limited as those of any other Lepidopterous genus—indeed, the problem strikes me as a remarkably easy one, the key to which lies in the fact that no amount of obsolescence of maculation authorizes a species, while change of *pattern* can be easily detected even in specimens with the markings much broken. Reference for general papers, lists, &c., relating to American species, are :—

1816—Hübner, Verzeichniss, 183.
1856—Walker, C. B. Mus. Lep. Het., III., 594, syn. sp.
1860—Clem, Proc. Ac. N. Sc. Phil., XII,, 526.
1873—Stretch, Zyg. and Bomb., 73, fig. and syn. sp.
1876—Moeschl., Stett. Ent. Zeit., 37, 296.
1883—Neumoegen Papilio, III., 150, list sp.
1887—Smith, Ent. Amer., III., 117.

In the paper last cited I give at some length the features to be relied upon for specific separation in this genus.

The head is retracted, tongue weak and short, palpi almost rudimentary, antennæ moderate in length ; bipectinated in the ♂, simple in the ♀. The legs are moderate in length, the posterior longer ; spurs short and weak, but normal as to number ; the tarsi are finely spinulose, the claws simple.

Moeschler, in the Stett. Ent. Zeit., 1876, v. 37, p. 296, says :—*A. nais, phyllira* and *virgo* have a distinct claw on the fore tibia, but I utterly failed to find any trace of it on any specimens examined by me.

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The venation of *virgo* and *argc*, compared, showed no differences; ten out of the subcostal in each, neither with an accessory cell. In other respects it agrees with the venation typical of the family.

The recent suggestions as to synonomy have been so conflicting, and none being based on a monographic study, they are simply indicated under the proper head, but not adopted.

A. achaia Grt. & Rob.

1867—Grt. & Rob., Trans. Am. Ent. Soc., I., 334, pl. 6, ff. 44, 45, *Arctia.*
1868—Bd., Lep. Cal. (Am. Soc. Ent. Belg., XII.) 76, *Chelonia.*
1873—Stretch,* Zyg. and Bomb., 74, *Arctia.*
1873— " " " 124, pl. 5, ff. 17–21, *Arctia.*
1875—Hy. Edw., Proc. Cal. Ac. Sci., V., 187, *Arctia.*
1881—Butl., Papilio, I., 131, *Arctia.*
1882—Stretch, Papilio, II., 91, varieties of.
1887—Smith, Ent. Amer., III., 111, *Arctia.*
var. *barda* Edw.
1881—Edw., Papilio, I., 39, *Arctia.*
var. *ochracea* Stretch.
1873—Stretch, Zyg. and Bomb., 124, pl. 5, ff. 18 and 21.
1881—Butl., Papilio, I., 131, an sp. dist. *Achaia.*
Habitat—No. Calif., Oregon.

A. anna Grt.

1863—Grt., Proc. Ent. Soc. Phil., II., 335, pl. 8, f. 1, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, 220, pl. 9, f. 6, ♀, *Arctia.*
1875—Streck., Lep. Rhop. et. Het., I., 106, =*persephone.*
1875—Grt., CAN. ENT., VII., 196, an sp. dist.
1878—Streck., Proc. Dav. Ac. Sci., II., 273, =*persephone.*
1879—Græf, Bull. Bkln. Ent. Soc., I., 4, =var. *persephone.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, =*parthenice* var.
1883—Neum., Papilio, III., 149, =*persephone.*
var. *persephone* Grt.
1863—Grt., Proc. Ent. Soc. Phil., II., 433, *Arctia.*
1864—Grt., Proc. Ent. Soc. Phil., III., 77, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1886—Grt., CAN. ENT., XVIII., 110, =*anna* var.
1887—Smith, Ent. Amer., III., 110, *Arctia.*
virguncula ‡ Wlk.

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1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. syn.
Habitat—Penna., N. Y.

The form *anna* is much the least common, being in fact but a suffused form of *persephone.* By the operation of the law of priority this suffused and aberrant form must remain the species, while the normal form remains the variety. It is much more widely distributed than above indicated.

A. approximata Stretch.
1885—Stretch, Ent. Amer., I., 104, *Arctia.*
Habitat—Canada.

A. arge Dru.
1770—Drury, Illustr., I., 35, pl. 18, f. 3, *Noctua.*
1791—Oliv., Enc., Meth., V., 92, *(Phalaena).*
1816—Hübner, Verz., 183, *Arctia.*
1837—Westw., ed. Drury, I., 33, *Spilosoma.*
1841—Harris, Rept. Ins. Mass., 244, *Arctia.*
1856—Wlk., C. B. Mus. Lep. Het., III., 609, =*dione.*
1858—Duncan in Jard. Nat. Lib., XXXII., 174, pl. 19, f. 2, *Spilosoma.*
1860—Clem., Proc. Ac. N. Sci. Phil., XII., 528, *Arctia.*
1862—Harris,* Ins. Inj. to Veg. ed. Flint, 346 *(life hist.)*
1873—Stretch,* Zyg. and Bomb., 74, 225, pl. 9, ff. 10 and 11, *Arctia.*
1874—Lintner,* Ent. Contr., III., 143, *Arctia.*
1875—Grt., CAN. ENT., VII., 196, *Arctia.*
Andrews,* Psyche, II., 79, *Arctia.*
1882—Gilbert,* Papilio, II., 50, *Arctia.*
1887—Smith, Ent. Amer., III., 111, *Arctia.*
dione Fabr.
1775—Fabr., Syst. Ent., 572, *Bombyx.*
1781—Fabr, Spec. Ins, II., 186, *Bombyx.*
1787—Fabr., Mant. Ins., II., 116, *Bombyx.*
1793—Fabr., Ent. Syst., III., 1, 442, *Bombyx.*
1797—Sm. Abb.,* Ins. Ga., I., 125, pl. 63.
1816—Hübner, Verzeichniss, 180, *Euplagia.*

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1837—Westw., ed. Drury Illustr., I., 32, pr. syn.
1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia.*
1862—Clem.,* App. to Morris, Syn., 340, pr. syn.
1863—Saund., Synopsis Can. Arct., p. 7, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 118, pr. syn,
1868—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 78, *Chelonia.*
1883—Neum, Papilio, III., 150, an sp. dist.
1886—Grt., CAN. ENT., XVIII., 108, *Arctia.*
1887—Smith, Ent. Amer., III., 111, pr. syn.
Habitat—Canada to Georgia, Texas, west to California, Vancouver; abundant.

Recorded food plants are *Plantago* and *Polygonum*, but the list is much larger.

A. blakei Grt.

1864—Grt., Proc. Ent. Soc., Phil., III., 523, pl. 5, f. 2, ♀, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, 224, pl. 9, f. 9, ♂, *Arctia.*
Habitat—Colorado.

A. bolanderi Stretch,

1873—Stretch, Zyg. and Bomb., 74, 76, pl. 3, f. 13, *Arctia.*
1887—Smith, Ent. Amer., III., 111, *Arctia.*
Habitat—California.

A. brucei Edw.

1888—Edw., Ent. Amer., III., 183, *Arctia.*
1888—Bruce,* Ent. Amer., III., 219, *Arctia.*
Habitat—Colorado.

Food plants are *Plantago* and *Polygonum.*

A. celia Saund.

1863—Saund., Proc. Ent. Soc., Phil., II., 59, *Arctia.*
1863—Saund., Syn. Can. Arct., p. 13, *Arctia.*
1865—G. & R., Ann. Lyc. Nat. Hist., N. Y., VIII., 368, =*figurata.*
1869—Saund.,* CAN. ENT., II., 74, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, var. *figurata.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI, 70, =*nais.*
1887—Smith, Ent. Amer., III., 111, *Arctia.*
Habitat—Canada.

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A. cervinoides Strk.

1876—Strk., Proc. Ac. N. Sci., Phil., XXVIII., 151, *Arctia.*

1879—Strk., Rept. Chief., Eng., 1878-79, V., 1860, pl. II., f. 4, *Arctia.*

1887—Smith, Ent. Amer., III., 112, *Arctia.*

Habitat—Colo., July 15.

This will prove an undersized *phyllira*, with black secondaries.

A. complicata Wlk.

1864—Wlk., C. B. Mus. Lep. Het. Supp., XXXI., 279, *Arctia.*

1868—Grt., Tr. Am. Ent. Soc., II., 117, *Arctia.*

1873—Stretch, Zyg. and Bomb., 74, 79, =*dahurica.*

1883—Neum. Papilio, III., 149, =*achaia* var.

A. dahurica Bdv.

1843—Bdv., Icon., Hist. Lep., 126, pl. II., f. 1, *Chelonia.*

1845—H. Sch., Schmett Eur., II., 145, *Chelonia.*

1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 49, *Chelonia.*

1856—Wlk., C. B. Mus. Lep. Het., III., 597, *Arctia.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 527, *Arctia.*

1862—Clem., App. to Morris Syn., 341, *Arctia.*

1867—G. & R., Tr. Am. Ent. Soc., I., 336, pl. 6, f. 41, ♂, *Arctia.*

1873—Stretch, Zyg. and Bomb., 78, pl. 3, f. 10, ♀, *Arctia.*

1883—Neum., Papilio, III., 150, var. *complicata.*

Habitat—California.

A. decorata Saund.

1863—Saund., Syn. Can. Arct., p. 12, *Arctia.*

1863—Saund., Proc. Ent. Soc., Phil., II., 60, *Arctia.*

1864—Grt., Proc Ent. Soc., Phil., II., 77, pl. I., f. 4, ♀, *Arctia.*

1865—Grt., Ann. Lyc. N. Hist., N. Y., VIII, 369, =*nais.*

1873—Stretch, Zyg. and Bomb., 74, =var. *nais.*

1878—French,* 7th Rept. Ins. Ills., 182, *Arctia.*

1881—French,* Papilio, I., 8, *Arctia.*

1882—French,* Papilio, II., 179, *Arctia.*

1883—Hulst, Bull Bkln. Ent. Soc., VI., 70, =*nais.*

1883—Neum., Papilio, III., 149, an sp. dist. *nais.*

1887—Smith, Ent. Amer., III., 111, =*nais.*

colorata Wlk.

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1864—Wlk., C. B. Mus. Lep. Het., XXXI, 302, *Aloa*.
1868—Grt., Tr. Am. Ent. Soc., II., 117, pr. syn.
Habitat—Can., N. Y., Penna.

The citation of *colorata* as a synonym of *decorata* was made by Mr. Grote before he concluded that *nais* and *decorata* referred to the same forms. I leave the reference as made, since the monographic study of the species may develope the above as the correct conclusion. See under *nais* for further references.

A. determinata Neum.
1881—Neum., Papilio, I., 28, *Arctia*.
Habitat—Colorado.

A. docta Wlk.
1856—Wlk., C. B. Mus. Lep. Het., III., 592, *Euprepia*.
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, =*mexicana*.
mexicana Grt. & Rob.
1865—G. & R., Ann. Lyc. N. Hist., N. Y., VIII., 367, pl. 13, f. 3.
1883—Neum., Papilio, III., 150, =*docta*.
autheola Bdv.
1868—Bdv., Lep. Cal. (Ann. Soc. Ent. Belg., X.), 76, *Chelonia*.
1876—Stretch, Zyg. and Bomb., 74, pl. 3, ff. 3, 4, *Arctia*.
1881—Butler, Ann. & Mag., N. H., Ser. 5, VIII., 310, =*docta*.
1883—Neum., Papilio, III., 150, =*docta*.
arizonensis Stretch.
1873—Stretch, Zyg. and Bomb., 217, pl. 9, f. 4, *Arctia*.
1876—Stretch, Rept. Surv. West. 100 Mer., V., 799, pl. 46, ff. 2 and 3, = var *docta*.
1883—Neum., Papilio III., 150, =*docta*.
Habitat—Ariz., Calif., Mexicana.

A. dodgei Butler.
1881—Butl., Ent. Mo. Mag. XVIII., 136, *Arctia*.
Habitat—Unknown.

According to Mr. Butler this may be a Mexican representative of Drury's species *phyllira*, but the single specimen bears no locality label.

(To be continued.)

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NOTE ON THE LARVAL ORNAMENTATION OF THE N. AM. SPHINGIDÆ.

BY A. R. GROTE.

In my "Hawk Moths of North America," I have assumed that the caudal horn is a prolongation of the skin itself, stiffened by chitine (p. 41). It supports a bristle, or pair of bristles, and Dr. W. Müller, whose valuable work on the *Nymphalidæ* of South America in their larval stages (Zoologischen jahrbuchern, 1886.) I have noticed in these pages, figures the horn of *Dilophonota*, p. 249, and regards it as a prolongation of the base supporting the two normal bristles of the eleventh segment. We may assume that the caudal horn is a later development, and that the surmounting bristles were originally sessile as in the *Attacinæ*. The bristles themselves may have disappeared, and the horn itself, the prolongation of the base, remain. I would draw attention to this character as supporting generally my arrangement of the family. The thoracic "horns" of *Ceratomia* are probably homologous with those of *Citheronia*. This character, together with the comparatively sunken head and soft brown colors of the moth allies *Ceratomia* with *Triptogon*, as I have pointed out. Dr. Wm. Müller concludes that the caudal horn of the Hawk Moths is the remains of what was once a system of bristles, and that there is a perfect homology with the *Saturnidæ*. This entirely agrees with my idea as to the derivation of the family, which may have thus been thrown off from the Spinners in a parallel direction with the *Ceratocampinæ*, The modern *Smerinthinæ* remain as the descendants of intermediate phases, the ocelloid spots and colors of the moth are retained. In this sense they are synthetic characters appearing in the other three or four groups which are to be referred to Smerinthoid affinities. The relatively small and sunken head, and the square prothoracic parts, the pectinate antennæ, are probably low characters in the Hawk Moths, recalling the Bombyces. In this view the shape of the body in *Hemaris* and allies is a point of widest departure, and warrants the position I assign to the *Macroglossinæ*. The method of pupation needs further elucidation. It must be studied in this group, with regard to the physical nature of the surface. Probably the cocoon is older than the absence of silk, the tendency to spin silk appearing by reversion in species to-day where it seems to have become gradually lost as a character. The change to pupation in the earth may have had some relation to changes in the surface conditions in past ages.

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DESCRIPTIONS OF LEPIDOPTEROUS LARVÆ,

BY WM. BEUTENMÜLLER, NEW YORK.

MAMESTRA LOREA, Güen.

Head black, with dirty, whitish, irregular markings; antennæ pink. Body of a dirty, creamy, brown color, except the first three segments blackish. Along the dorsum is a series of lozenge shaped blackish patches, one on each segment; on the dorsum are also two rows of minute piliferous spots and two rows along each side, where there is also on each segment an ill-defined, oblique, blackish stripe. Underside semi-translucent whitish, with a number of minute piliferous spots which bear a short pale brown hair, as also do the spots above. Thoracic feet pale brown. Length 34 mm. Collected April 21st. Imago emerged May 18th. Food-plants, strawberry and wild geranium.

PHYCIS RUBIFASCIELLA, Pack. variety.

Head deep chestnut brown, rugose; mouth parts whitish, cervical shield chestnut brown. Body brown, with a pinkish hue; on each side of the body are scattered a few minute piliferous spots each, with a short pale brown hair; on each side of the first and second segment is a shiny black spot. Thoracic feet black; abdominal leg concolorous to the body, which is the same as above. Length, 13 mm. Collected May 30th. Imago emerged June 17th. Food plant, alder. Living in a horn-shaped case. Another form of this species was published by me in the Ent. Amer., V., p. 38.

SALEBRIA CONTATELLA, Grote.

Head jet black, shining, as is also the cervical shield. Body pale green, with a series of about four or five longitudinal stripes, almost of the same hue, along each side, where there are three rows of minute piliferous spots, each bearing a short, light brown hair. Underside of body same color as above, except the first segment, dull black. The segments slightly decrease in size toward the posterior portion of the body. Length, 15 mm. Food-plant, locust *(Robinia pseudacacia)*. Living singly between two leaves spun together flatly. June 5th. Imago emerged July 8th.

BOTYS FISSALIS, Grote.

Head small, pale brown, shiny; mouth parts pitchy. Body very shiny, yellowish white, semi-translucent, with a number of piliferous spots concolorous to the body, except those in the first, second and third seg-

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ments, which are brown. Each spot with a light brown hair. The cervical shield same color as the body; lateral edges brown; underside same as above; thoracic feet tipped with brown. Length, .24 mm. Food-plant, asters; drawing together several leaves so as to form a bunch. May 31. Imago emerged June 18th.

SALEBRIA CELTELLA, Hulst (MS.)

Head pitchy black, with irregular, dirty, whitish markings, and an oblique stripe of the same color on each side. Body pale green, with a number of pea green, equidistant, longitudinal stripes, as broad as the intervening spaces. Cervical shield jet black, and on which the stripes of the body are sordid white. Along the subdorsum is a row of minute piliferous spots, and two rows along the sides. Body beneath green, and without marking, except the first segment is jet black, as are also the first pair of thoracic feet. A few hairs are also scattered over the body. Length, .22 mm. Food plant, *Celtis occidentalis*, folding together a few of the terminal leaves. Aug. Spins a rude cocoon between leaves.

NOTE ON THE GENUS CROCOTA AND PROF. J. B. SMITH.

BY A. R. GROTE.

Readers of Mr. Smith's papers will have noticed the frequent critical remarks at my expense, and it may have appeared to them that I have been often most culpable. But, in every case, although I have not the pleasure of knowing all of Mr. Smith's publications, these criticisms can be shown to be perversions of the case. So in the genus *Crocota*, in which determinations are difficult, Mr. Smith says (p. 193, vol. XXI.):— "The matter has been further confused by Mr. Grote's persistent refusal to refer to Mr. Reakirt's species," and further that "he ignores them altogether." I ask anyone how I can "confuse" the "matter" by simply not referring to Mr. Reakirt's species by name, seeing that I do not know these species, have never seen the types, and am not disposed to believe in them? And, moreover, since Mr. Reakirt's descriptions refer to Eastern species, *postdating* my own, and those of other author's which I discuss, if they are not distinct species they are thus clearly synonyms, and Mr. Smith says the descriptions may be "poor," as indeed they seem to me to be. But the whole statement is inaccurate, for everywhere,

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where I have referred collectively to the species of *Crocota*, I have also expressly referred to Mr. Reakirt's descriptions, giving my reasons for not particularly citing the species by name. Hence, my writings have had the exactly contrary effect, to that stated by Mr. Smith, "of causing others to lose track of" Mr. Reakirt's "descriptions." I always reminded students of the existence of Mr. Reakirt's descriptions, though I confessed I could not make them out. Nor is Mr. Smith apparently any wiser than I. I did, indeed, suppose that *nigricans* was a synonym of *opella*, or founded on the dark form of that species, but I kept this and all other surmises to myself, because I had no certain data to go upon, and a scientific writer must, in such cases, have a reasonable certainty. With regard to *læta*, I, in my first list, am the first to refer *treatii* here, to show that I had probably rediscovered a totally unknown species since Boisduval's figure. I first, in fact, direct attention to this unrecognized figure, which has been copied in Encyc. Brit. To me belongs the credit of directing Mr. Smith's attention to this figure of *læta* and its probable identity with *treatii* in my first Check List. This identification is not quite assured in the absence of any description; hence, in my new Check List, I made a query. If Mr. Smith had written correctly and impartially on the genus *Crocota* he should have said: Mr. Grote first refers this genus to the *Arctiinæ* on account of the presence of ocelli, and removes it from the *Lithosiinæ* where he leaves *Ameria*. Further, Mr. Grote has figured the species he described in Proc. Ent. Soc., and no doubt exists, in a confusing genus, of the species he intended. Instead of this, with the evident intention of making an adverse criticism *coute qui coute*, we have the perversions above exposed. As was the case when Mr. Smith replied to my statement, that, in the *Deltoidinæ*, the eyes were always "naked," that in one genus the eyes were "lashed" (as if these characters were contradictory or exclusive), it must seem clear that the limit of proper criticism is exceeded by Mr. Smith. The errors of an author must be judged by the material at his command in specimens and literature. If under all the circumstances under which he laboured his work is of a character virtually to advance the study of his subject, and if a large proportion of his determinations are accurate and in the state of the science very opportune, no right-minded person should be able to bring himself to prevert such labours. I may remark, in conclusion, that I do not regard *Cydosia*, *Cerathosia* or *Gnophæla*, as *Arctiinæ*, and I believe

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that they are thus incongruously placed and associated. Both *Cydosia* and *Gnophæla* appear to me to be *Zygænidæ* with Bombycid analogies *in sensu* Packard. I hope Dr. Packard may be induced to study these forms. Neither do I believe our Texan species of *Cydosia* to be the *nobilitella* of Cramer. But all these questions, which ever way a full knowledge of these moths my determine us, must be entered into without temper and without unnecessary animadversions upon those whose experience has led them to opposite conclusions from those reached by the final verdict, a verdict which Mr. Smith's studies will, we may hope, be of a character to influence.

NOTES.

NOTES OF THE YEAR.

Dear Sir: With few exceptions insects were unusually scarce last season, probably on account of the continued cool weather and heavy rains. *Colias Philodice*, generally so abundant, was almost entirely absent, a few appeared in midsummer and the fall brood was more plentiful, but by no means abundant, and the latter might be said of most of our diurnals. The Noctuas were also conspicuous by their absence, at least at sugar, the baits failing to attract even the commonest species. *Eufitchia ribearea* was observed in numbers in a plot of black currant bushes, in an old orchard now included in Mount Royal Park, and *Orgyia leucostigma* was abundant on shade trees about the city. In the fall I found several species of *Eristalis* common on solidago blossoms, *E. Bastardi* and *E. Brousi* being especially abundant, while *E. transversus*, *E. Tenax* and *E. dimidiatus* were less common. The other orders were poorly represented, making it one of the worst collecting seasons in my experience.

F. B. CAULFIELD, Montreal.

ACKNOWLEDGMENT.

Dear Sir: The photograph from which the beautiful figure on p. 204, vol. xxi. of *Papilio Turnus* (aberrant form) was taken by Mr. H. N. Topley, of Ottawa, by the new Isochromatic process, and the engraving was made direct from the photograph. This acknowledgment should have appeared in the article, but was accidently omitted from the proof.

J. FLETCHER.

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A CORRECTION.

Dear Sir: In my note which appeared in your November number, I wrote, through inadvertence, *Phytolacca decandra.* The plant I referred to is *Veratrum viride*—not the "Garget," but the "Indian Poke" or "Poison Poke." I am ashamed at having to take up valuable space with a correction. THOMAS W. FYLES.

CORRESPONDENCE.

THE COTTON WORM.

Dear Sir: The cotton worm (*Aletia Xylina*, Say). This interesting moth has been tolerably abundant during the middle of September in this district, and is as much of an entomological conundrum as ever. I took several specimens round the electric lights. They seemed quite fresh and presented no appearance of being travel-worn by their supposed journey from the cotton fields of the "land of Dixie" I captured two specimens on September 19 and endeavoured to hibernate them but failed, one dying on October 12th and the other on October 15th. I hope to make another attempt at some future day. It does seem curious that we cannot solve the problem of the northern food-plant of this moth.

E. BAYNES REED, London, Ont.

CHRYSALIDS DEVOURED BY CATERPILLARS.

Dear Sir: A few days ago I found a number of *Pyrameis cardui* larvæ and also several (4) of the common reddish brown hairy caterpillars (*Spilosoma Isabella*), so often seen about gardens in the fall feeding on plants of the common garden hollyhock (*Althæa rosea*). Not having extra boxes to spare I placed both species in a roomy pasteboard box with a plentiful supply of hollyhock leaves. In the course of a day or two several of the Cardui larvæ hung themselves to the corner of the box, and in a short time three more transformed to chrysalids. What was my surprise on looking into the box this morning to see if any more had hung or transformed to find the reddish brown caterpillars had devoured two of the Cardui chrysalids, and one of the caterpillars was actually engaged eating the third and had consumed fully one-half of it. This was not done from lack of food, as there was an *abundance* in the box. Here, then, is a new source of destruction to our butterflies—a sort of cannibalism among caterpillars.

SHELLEY W. DENTON, Wellesley, Mass.

Mailed January 9th.

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The Canadian Entomologist.

VOL. XXII. LONDON, FEBRUARY, 1890. No. 2.

DESCRIPTION OF A NEW SPECIES OF MELITÆA FROM SOUTHERN CALIFORNIA.

BY W. H. EDWARDS, COALBURGH, W. VA.

MELITÆA AUGUSTA.

Male.—Expands from 1.6 to 1.75 inch; belongs to *Chalcedon* group, but is as conspicuously red as the species *Chalcedon* is black; upper side black, the surface nearly covered with light red and pale yellow spots, disposed as in the group; the basal areas dusted with yellow scales, which, on primaries, extend along both margins; costa of same wing edged red; both hind margins bordered by small red spots, varying in shape, sometimes narrow and as of a broken stripe, sometimes more or less rounded or ovate; the spots of second row are small, lunular, largest on secondaries, edged with red, the interior being yellow, or they are nearly all red with a small yellow patch in middle; sometimes this yellow is thinly washed red; the third row on primaries is either wholly yellow, or yellow with red edges, particularly on the outer side; on secondaries wholly red, and often very deep, so as to make a conspicuous broad band; the fourth row on primaries is red, sometimes with the spots next the two margins either yellow or in part yellow; around the end of cell yellow spots four or five in number; in the cell spots of red and yellow alternately, four in all, the yellow one at base more or less stained red; two yellow spots below cell with black ground between, and nearer base a small duplex red one; the fourth row on secondaries is yellow, either of small spots or pretty large ones, and the three or four from costal margin are red on their outer sides; a red stripe outside the cell from the end to costal margin; two small yellow spots inside cell, with a red one between them and a yellow spot below; fringes yellow, black at the tips of the nervules. Some examples have scarcely any yellow, the yellow having been replaced by red, or tinted red.

Under side of primaries red, the yellow spots repeated, enlarged, and

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of clear color; outside end of cell a large suboval red spot heavily edged black, and the cell is crossed by two wavy black lines.

Secondaries have the margins red, in a continuous band; the second row yellow, on black ground, lunate; the third row red, rounded on inner side and edged narrowly with yellow on all sides but the exterior; the fourth row yellow, cut unequally from one margin to the other by a black line; thence to base red; a triangular yellow spot at end of cell, and in a straight row from costal margin three yellow spots, one on margin and partly in costal interspace, one at top of cell, the third in lower median interspace. Sometimes the fourth row is expanded towards base along inner margin, giving the appearance of a fourth spot to the basal row; the shoulder and edge of costa yellow.

Body above black; red hairs on collar; thorax beneath yellow; abdomen red at sides, yellow along venter, red at end; legs red; palpi red; antennæ pale red-brown, annulated whitish above, red below, club black on upper side, the tip ferruginous, elsewhere red-brown.

Female.—Expands from 1.7 to 2.2 inches.

Like the male in general, but the spots larger in proportion; on the underside, the spots of second row on each wing are large, lanceolate, the outer side deeply incised. In occasional examples the outer part of upper side of secondaries is covered by a broad red band in place of the spots of second and third rows, and this area is separated from the narrow marginal band by a black line.

In an aberration there is no trace of yellow on upper side, and on the under side of secondaries the yellow bands from margin to cell are replaced by wood-brown, while the yellow basal spots are obscured.

I name this species *Augusta*, in memory of the late Mrs. W. G. Wright. Mr. Wright has taken it in vicinity of San Bernardino abundantly, and writes of it thus: "*M. Augusta* is found on top of the mountains, elevation 5,000 feet, and is not found at all till you reach the top. They do not descend the mountain sides, nor are they found in the canyons. On the summit oak and pine trees are scattered, and the ground is covered with grasses and flowering plants. The butterfly seems all the time on flowers, and is a great feeder. I have never seen a

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pair in copula, nor a female ovipositing, and I know nothing of the early stages. Every year I find *Augusta* at the same place, in the month of June."

It seems to me probable that *Augusta* will be found in Utah and Arizona, perhaps also in Nevada.

TENTHREDINIDÆ COLLECTED AT OTTAWA, 1889.

BY W. HAGUE HARRINGTON, OTTAWA.

The past season was not a favorable one for the collection of Hymenoptera. The early spring was very fine and warm, but was followed by prolonged spells of cool and rainy weather, which not only made collecting difficult, but appeared to destroy many of the insects. This will be seen by the following list, in which a large proportion of the species are represented by single specimens. It contains about eighty species, or nearly two-thirds of those that have so far been taken in this locality.

Few of the species were at all common, the most abundant and destructive being *N. Erichsonii* Hartig., which we now find wherever there are larches, and by whose larvæ these trees are defoliated and injured. *N. Ribesii* Scop. *(ventricosus* Hartig.), the gooseberry saw-fly, and *H. maculatus* Norton, the strawberry saw-fly, were also numerous. On the other hand several of the species, especially of Macrophya and Tenthredo, which are usually common in midsummer, were not observed, and there was a noticeable scarcity of larvæ.

Cimbex americana Leach, var. *decemmaculata* Leach, female, June 16.
var. *La Portei* St. Farg., male, May 11.
Trichiosoma triangulum Kirby, male, May 12.
Abia Kennicotti Norton, female, May 11.
Hylotoma clavicornis Fabr., female, June 13.
McLeayi Leach, female, May 10.
Priophorus æqualis Norton, female, July 14.
Pristophora identidem Norton, male, May 27 ; male, June 16.
tibialis Norton, female, May 12 ; female, June 26.
Euura orbitalis Norton, three females, May 24.
Nematus aureopectus Norton, female, May 9; two females, May 10; female, May 18 ; female, May 27.

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bivittatus Norton? female, May 11.
corniger Norton, male, May 17; male, May 24; male and female, May 27; female, June 2; male, June 16; male, Aug. 8.
Erichsonii Hartig., female, abundant from May 19; male, June 15.
latifasciatus Cresson, female, June 7.
malacus Norton, female, May 18.
mendicus Walsh, one male and two females, May 9; female, May 17; female, June 26.
pleuricus Norton? female, May 9.
Ribesii Scop., female and male, common, May, June.
Several species not yet examined, May, June.
Emphytus apertus Norton, female and male, May 17; female, May 18; female, May 27; female, Aug. 8.
hullensis Prov., female, June 23.
mellipes Norton, male, May 11; female, May 24.
Harpiphorus maculatus Norton, male and female abundant, May 9 to June 26.
Dolerus albifrons Norton, seven males and two females May 24.
aprilus Norton, male and female, May and June, common.
arvensis Say, female, April 19, May and June, common.
bicolor Beauv., female, May 27.
collaris Say, female, May 10; female, May 19; female, June 2.
unicolor Beauv., male, May 12.
Monophadnus bardus Say, female June 13.
medius Norton, two females, May 11; female, May 18; female, May 24; two females, June 13.
rubi Harris, female, May 12; female, May 27.
Phymatocera canadensis Harrington, female, May 10; female, May 11; female, May 17.
fumipennis Norton, four males and three females, May 17; female and male, May 18; female, May 20; two males, June 22.
Hoplocampa halcyon Norton, female May 11; female, May 17.
Monostegia ignota Norton, two males and one female, May 27.
rosæ Harris, female, May 19; female, May 22; female, May 24.
Selandria flavipes Norton, two males, May 24; male and female, June 2; female, June 8; male, June 13; two females, August 8.
Allantus basilaris Say, female, June 28; male, July 28.

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Macrophya externa Say, female, June 26.
flavicoxæ Norton, female, June 13; female, June 23; two females, June 26; two females, June 28; female, July 1.
varia Norton, female, June 20.
sp. female, June 26.
Pachyprotasis dĕlta Prov., male, June 16; female, June 20; one male and two females, June 23; two females, June 30.
omega Norton, male, June 28; male, July 28.
Taxonus albidopictus Norton, female, July 14.
amicus Norton, male, June 16; male and female, June 26.
rufipes Harrington, male, May 18.
unicinctus Norton, female, May 27.
Strongylogaster annulosus Norton, female, May 24.
apicalis Say, female, June 13; female, June 28; male, July 11; female, July 28.
longulus Norton, male, May 24.
luctuosus Prov., female, May 22.
robustus Prov., ? female, June 13; two females, June 28; male, July 1.
soriculatus Prov., female, May 24.
tacitus Say, male, May 24; female, June 8; male, August 8.
Tenthredo eximia Norton, male, May 24; female, June 28.
grandis Norton, female, June 15.
mellina Norton, female, July 7.
ruficolor Norton, female, May 24; female, July 1.
rufipes Say, female, June 2; female, June 23; two females, June 26.
rufopectus Norton, male, June 14; male, June 16; female, June 26; male, July 1.
verticalis Say, female, June 13; female, July 1; female, July 14.
Tenthredopsis atroviolacea Norton, female, June 16; female, June 30.
Lophyrus Lecontei Fitch, two females, (bred) May.
Monoctenus fulvus Norton, one male and two females, May 13.
Lyda canadensis Norton, female, June 26.
luteicornis Norton, female, June 2.
luteomaculata Cresson, female, May 24.
perplexa Cresson, male, May 11; male, May 17.
quebecensis Prov., female, June 30.

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THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA COMPARED.

(Fifth Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Orthosiini.*

The vestiture is woolly, and in this lies a distinguishing character from the *Agrotini* and *Hadenini*, which some genera much resemble, while the body is hardly tufted; the rather broad thorax has sometimes a median ridge. The colours of the moths are often shades of brown, red and yellow, like the autumn foliage, in which many of the hibernating species hide. The eyes of the first genera are hairy; in several the tibiæ are spinose, the reverse being usually the case. Whether our, mostly western, species allied to *Perigrapha cincta* are strictly congeneric, I have not been able to decide. *Acerra normalis* has simple antennæ in the male; the ornamentation in most cases suggests the relationship. There are two European species of *Perigrapha* against seven related North American species. The genus *Tæniocampa* has twenty-two described American species and only eleven European; among these is one, *alia*, identical. I have not a particle of doubt that for this genus the term *Graphiphora* Hübn., must be retained. My efforts to place the generic nomenclature upon a final basis, by fixing the types in 1874, has met with thoughtless opposition and incorrect criticism. The question of whether Hübner, or others,held our modern (supposed by empirics infallible) ideas upon genera, is quite beside the question of the oldest and therefore proper name for a genus. I have exposed this sort of reckless criticism in the second part of my Check List, 1875, 1876. Only my desire to avoid contention and to enable a comparison of our fauna by the use of the same terms, has induced me to cede the present instance, because the name *Graphiphora* taken from Hübner (to whom we owe almost *all* the leading generic names in the Noctuidæ), had been mis-applied. I think, now, I may have been wrong in this, and that *Graphiphora* should be used, as I originally proposed, with the type *Gothica*, and *Tæniocampa* rejected. Only in this way shall we obtain a stable nomenclature, and the European catalogues must conform, if nearer conclusions are to be arrived at, and lists are to be useful beyond a mere stringing of the different species.

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The North American hairy-eyed genera allied to *Tæniocampa* are, further, *Crocigrapha*, with a tuft behind the collar; *Orthodes*, *Himella* and *Morrisonia* (the species of which latter curiously resemble *Actinotia*, but seem to hibernate, being found early in the year on sallows); while I have described American species belonging to the naked-eyed European genera *Parastichtis* and *Anchocelis*. Naked-eyed genera, with armed tibiæ, are *Pachnobia* and *Metalepsis*, occurring in both faunæ, and *Pseudorthosia*, *Choephora*, *Pseudoglaea*, which seem to be American only. *Trichorthosia*, which has hairy eyes, seems to be more allied to *Xanthia*, or *Orthosia*, in the shape of the wings; but, if we do not divide this tribe, as is perhaps unnecessary, it may be ranged with the other hairy-eyed genera, together with the somewhat aberrant *Trichocosmia*. The principal genus is, perhaps, *Orthosia*, of which fourteen European and seventeen American species are described, mostly of a European habitus, and one representative, *ferrugineoides*. While I have referred one identical species *(togata)* to *Xanthia*, which, as distinct from *Orthosia*, contains seven European species, the singular genus *Jodia* Hub. (=*Hoporina* Boisd.), has an American representative of *croceago* in *J. rufago* Hübn. *Eucirroedia* is a modification of the European genus *Cirroedia*; while the peculiar genus *Scoliopteryx* with its one species, *libatrix*, is common to Europe and America, from Hudson's Bay to Virginia, and is probably a survival of the former circumpolar fauna. *Glaea* Hübn. (=*Orrhodia* Hübn., *Cerastis* Tr.) has twelve European and only four American species, but the nearly related American genus *Epiglaea*, which differs from *Glaea*, much as *Richia* differs from *Agrotis*, by the presence, namely, of a median thoracic ridge, has five, and *Homoglaea* two described species. Our most beautiful species is *H. carnosa*, in which the egg is also pink in colour. *E. venustula* is said to be the same as *E. sericea*; if the description of the latter is compared, it will be seen to contradict that of *E. venustula* in important points, which remain incomprehensible if the two are really the same. The genera *Ipimorpha* and *Calymnia* have representative, the genus *Cosmia*, an identical species, *paleacea*. While there are a few peculiar genera in both faunæ, such as *Dicycla* in Europe, and *Zotheca* in America, the affinities of the two faunæ in this tribe are strongly marked. The peculiar genus *Scopelosoma* has in Europe one, in America nine species. Of these it is difficult to say which is nearest to the European *satellitia*; the identification of Guenèe's *sidus*

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is hence almost impossible; his type also cannot be found. In my opinion he may have had a form of *Walkeri* before him; but whether this, or *vinulenta*, or even *tri-stigmata*, or *Morrisoni*, cannot, with certainty, be made out from his comparative description. As I have separated all the American forms under distinct names, and Mr. Thaxter has shown the distinctness of most of them by breeding, these names should be retained until further evidence be forthcoming as to the single species indicated by Guenèe. A different course would be the result of mere opinion and, without scientific value, only make confusion.

Tribe *Calocampini.*

The vestiture resembles that of the preceding tribe, but the wings are narrower, the legs proportionately shorter, unarmed. The palpi are short; male antennæ thickly ciliate. The primaries are blunt, not widening outwardly as much as usual, with gray or brown, streaky, stone-like markings, hence the name *Lithophane*, used for the principal genus by Hübner. This genus is incorrectly called *Xylina;* Hübner's genus of this name having for type a species of *Hadena.* It seems to have been customary for earlier authors to take names out of Hübner's writings and apply them arbitrarily, with or without diagnosis. The injustice and absurdity of this proceeding must be evident to all thinking persons. Only an empiric, full of his own importance and wishing to elevate himself by contrast, can commit the blunder. If Hübner has not given neurational characters, it is because neurational characters were not then known; at least he has not given us incorrect descriptions of the venation, which is in his favor as compared with certain quite modern writers. *Lithophane* has eight European and about twenty-five American species; again a large preponderance. Of these, *Thaxteri* represents the European *lambda;* but no variety of the latter corresponds with our American form, which must be regarded as a distinct representative species accordingly. The European *ingrica* seems to be represented also by *pexata* and its variety *Washingtoniana*, although in the latter instance nearer comparisons are necessary, which I have not been able to make. *Lithomia* Hübn., which differs by the character of the palpal vestiture and the elevated collar, has apparently a representative species in *germana;* but I strongly suspect that this is really identical with the European *solidaginis.* *Calocampa* has

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two European and apparently four American species, one of which is unknown to me; of the other three, *nupera* is said to represent the European *vetusta*, although perhaps identical with it; *cineritia* has the widest range, while both this and *curvimacula* are quite different from either of the European forms. The representation of this tribe in Europe is covered by the American forms.

Tribe *Cucullíini.*

The elongate wings are sharply pointed, the collar hood-shaped; the abdomen is tufted terminally and extends beyond the proportionately small secondaries. The European species (43) greatly outnumber the described American forms (11). There are a large number of closely related species in the European fauna, many of comparatively recent detection. Perhaps more remain to be described in North America, though it is probable that both this and the next tribe will show an excess of European forms. The specific groups seem to be represented in America. I do not know, however, *luna*, which appears to be allied to the European silvery forms. In addition we have a Californian species, *matricariæ* Behr. (=*serraticornis* Lintr.), which has pectinated ♂ antennæ; I have doubted its being a true *cucullia.*

Tribe *Cleophanini.*

I have referred to *Cleophana*, two American species with hood-shaped collar and the facies of *Cucullia*, but with a claw to the front tibiæ. The other European genera, *Epimecia*, *Calopharia*, I have not recognized. *Nyctophœata* I believe to be a Heliothid form.

Tribe *Euteliini.*

In this tribe of smaller moths, the wings are more or less extended in repose, in the American genus *Marasmalus* folded like a fan. The small secondaries ally them to *Cucullia.* The antennæ have a basal tuft; the collar cut out behind, not hood shaped; the abdomen more or less tufted; the eyes naked. The American *Ripogenus pulcherrimus*, a rare moth, seems to be related to the European *Eutelia adulatrix.*

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Tribe *Ingurini.*

The male antennæ are simple at tip. An American form coming to our fauna probably from the south. The form resembles the preceding tribe, but the wings are entire. The species of the single genus *Ingura* are small moths, resembling the species of *Abrostola* in ornamentation, except, perhaps, *oculatrix*, which is a pretty, singularly marked moth.

Tribe *Anomiini.*

Thinly or closely scaled untufted forms, with rather broad and pointed wings and slimy vestiture, the larvæ half loopers. *Anomis* has uneven margins to the primaries. *Aletia* (the "cotton worm") has them even, somewhat sickle-shaped. *Pteratholix* and *Chytoryza* have peculiar clear spots and structure of the fore-wings. The tribe is American, and comes to our fauna from the south.

Tribe *Litoprosopini.*

Larger species with Plusia-like palpi, untufted, with brown wings, having curious ocellate markings and metallic points on secondaries. *Hatney* from Cuba, *confligens* from the west coast, *futilis* from Florida, all belonging to *Litoprosopus*, and are tropical American forms intruding into our territory in the south.

Tribe *Calpini.*

The fore-wings are wide, with pointed apices, full external margin, a tooth on inner margin. Eyes naked, lashed. Palpi prominent, hirsute to the tips, terminating bluntly as if cut off. A single genus and species in Europe, *Calpe capucina*, has apparently an American representative in *C. canadensis* Beth. I have not been able to study other genera, indicated by Guenèe and figured by various writers. This tribe would seem to be tropical in its origin. The genus *Calpe* probably belonged to the tertiary circumpolar fauna, and is of so pronounced a form that the American and European descendants have retained a decided resemblance. I do not know that *Canadensis* has been bred or carefully compared with its European ally, but I was able to recognize type specimens among Mr. Walker's synonyms and somewhat confusing generic references in this family. Full and careful comparisons are needed in many cases to decide whether the species are representative or identical.

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 14, Volume xxii.)

A. doris Bdv.

1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg.), 77, *Chelonia.*

Habitat—So. California.

I am not aware that any reference of this species to the rank of synonyms has been made. It refers almost certainly to one of our western species now known under another name. Mr. Grote has omitted the species from his list.

A. edwardsii Stretch.

1873—Stretch, Zyg. and Bomb., 74, 77, pl. III., f. 9, *Arctia.*

1883—Neum., Papilio, III., 149, =*achaia?*

1887—Smith, Ent. Amer., III., 111, =*dahurica.*

Habitat—California.

A. excelsa Neum.

1883—Neum., Papilio, III., 70, *Arctia.*

1883—Hulst.,* Bull., Bkln. Ent. Soc., VI., 69, =*nais.*

Habitat—No. Car., New York, Long Island.

Food plant—Plantago major.

A. elongata Stretch.

1885—Stretch, Ent. Amer., I., 105, *Arctia.*

1885—Neum., Ent. Amer., I., 93, =var. *determinata.*

Habitat—Was. Terr.

The curious anomaly of a species being referred as a synonym before it was described arose from the fact that Mr. Stretch, basing his species upon Mr. Neumoegen's material, returned the specimens before sending in the papers for publication. Mr. Neumoegen, working on the genus, made the reference from the label, and both gentlemen sent in their papers for publication at nearly the same time.

A. figurata Drury.

1770—Dru., Illustr., II., pl. XII., f. 4, *Bombyx.*

1820—Pal., Beauv., Ins. Afr. et. Am., Lep., p. 265, pl. 24, f. 4, ♂, *Phalæna.*

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1837—Westw., ed. Dru., Illustr., II., 22, *Nemeophila.*
1837—Harris, Cat. Ins. Mass., 73, *Arctia.*
1856—Wlk., C. B. Mus. Lep. Het. III., 625, *Nemeophila.*
1862—Clem., App. to Morris, Synops., 341, *Arctia.*
1865—Grt. & Rob., Ann. Lyc., N. Y., VIII., 368, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1879—Graef,* Bull., Bkln. Ent. Soc., I., 3, life hist.
1883—Hulst., Bull. Bkln. Ent. Soc., VI.. 70, =*nais.*
1887—Smith, Ent. Amer., III., 114, an sp. dist.
ceramica Hbn.
1816—Hbn., Verz., 180, *Euplagia.*
1865—Wlk., C. B. Mus. Lep. Het., III., 625, pr. syn.
var. *franconia* Edw.
1887—Edw., Ent. Amer., III., 184, *Arctia.*
Habitat—Can., N. Y., Mass., Pa., Ills., D. C.

The distribution is undoubtedly wider, and, as certainly, some of the described species must fall in as forms of this.

A. flammea Neum.

1881—Neum., Papilio, I., 9, *Arctia.*
1883—Hulst., Bull. Bkln. Ent. Soc., VI., 70, =*nais.*
1883—Neum., Papilio, III., 149, =*placentia* var.
Habitat—Florida.

A. f-pallida Strk.

1879—Strk., Rept. Eng., 1878–79, v. V., p. 1860, pl. II., f. 3.
1883—Hulst., Bull. Bkln. Ent. Soc., VI., 70, =*nais.*
Habitat—Rio Navajo, Colo., July 13.

This is simply a variety of *figurata*, in which all the marking save those forming a distinct ⌣, are obsolete. Any good series of *figurata* will show such specimens.

A. geneura Strk.

1878—Strk., Proc. Dav. Ac. N. Sci., II., 270, pl. IX., f. 5, ♂, *Arctia.*
1884—French, Papilio, IV., 158, ♂, *Arctia.*
1889—French, CAN. ENT., XXI., 162, *Arctia.*
Habitat—Colo. (Gilpin Co.), Mt. Shasta, Calif.

Mr. French seems rather inclined to believe that the California specimens may refer to a distinct species. There is a series of *geneura* in the

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U. S. National Museum, and this species, *incorrupta* Edw., with all its variations and *nevadensis*, G. & R., are all forms of a single, not very variable species, of which *docta* is the Californian form, and perhaps specifically distinct. The material in the National Museum will go far towards settling the relationship of these forms. The description of new species would be therefore rather unwise until this material can be properly studied.

A. michabo Grt.

1875—Grt., CAN. ENT., VII., 196, *Arctia.*
1883—Neum., Papilio, III., 150, *=arge.*
1886—Grt., CAN. ENT., XVIII., 108, an sp. dist.
1887—Smith, Ent. Amer., III., 111, an sp. dist.
Habitat—Nebraska, Dist. Col.

A. nais Dru.

1870—Drury, Illustr., I., pl. VII., f. 3, *Bombyx.*
1816—Hübner, Verzeichniss, 183, *Arctia.*
1823—Hübner, Zutr,* 300, ff. 599, 600, *Arctia.*
1837—Westw., ed. Drury, I., p. 15, *Spilosoma.*
1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morris Syn. 339, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 177, *Arctia.*
1868—Grt., Trans. Amer. Ent. Soc., II., 117, *Arctia.*
1868—Saund., CAN. ENT., I., 27, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1876—Moeschl., Stett. Ent. Zeit., XXXVII., 296, *Arctia.*
1882—French,* Papilio, II., 176, life hist.
1883—Hulst., Bull. Bkn. Ent. Soc., VI., 69, 120, *Arctia.*
1884—Bean,* CAN. ENT., XVI., 65, *Arctia.*
1887—Smith, Ent. Amer. III., 111, *Arctia.*

phalerata Harris.

1837—Harris, Cat. Ins., Mass., 73, *Arctia.*
1841—Harris, Rept. Ins., Mass., 245, *Arctia.*
1862—Harris, Inj. Ins., Flint, ed. 347, f. 166, *Arctia.*
1863—Saund., Syn. Can. Arct., 11, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 177, *Arctia.*

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1868—Grt., Trans. Amer. Ent. Soc., II., 117, pr. syn.
radians Wlk.
1856—Wlk., C. B. Mus. Lep. Het., III,, 632, *Apantesis.*
1868—G. & R., Tr. Am. Ent. Soc., II., 72, pr. syn.
colorata Wlk.
1864—Wlk., C. B. Mus. Lep. Het., XXXI., 302, *Aloa.*
1868—G. & R., Trans. Amer. Ent. Soc., II., 85, pr. syn.
1876—Butl., Journ. Linn. Soc., XII., 432, =*radians.*
var. *incompleta* Butl.
1881—Butl., Ann. and Mag., N. H., Ser. 5, v. VIII., 311, *Arctia.*
Habitat—Can., U. S., generally.

The species has been recorded as a strawberry feeder. Mr. Butler's variety refers to one of those forms with the maculation partly obsolete, such as any decent series will show. The synonomy of Walker's species has been already referred to. The reference is rather to *decorata* Saund. than to *nais* Dru., but I have not much doubt of the identity of the two forms. There is, however, a species closely allied to *nais* in the National Museum collection, which is, I believe, as yet undescribed.

A. nerea Bdv.
1868—Bdv., Lep. Cal. (Ann. Soc. Ent. Belg., XII.), 77, *Chelonia.*
Habitat—California.

This species has disappeared from our lists. It is perhaps only a variety of *arge*, but I cannot find that it has been so referred.

A. nevadensis Grt. & Rob.
1866—Grt. & Rob., Proc. Ent. Soc., Phil., VI., 1, pl. 1, f. 1, ♂, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1885—Neum., Ent. Amer., I., 93, —gives synonomy.
1886—Grt., CAN. ENT., XVIII., 109, *Arctia.*
behrii Stretch.
1873—Stretch, Zyg. and Bomb., 75, pl. 3, ff. 11 and 12, *Arctia.*
1873—Stretch, Zyg. and Bomb., 238, pr. syn.
var. *incorrupta* Hy. Edw.
1881—Edw., Papilio, I., 38, *Arctia.*
1883—Neum., Papilio, III., 71, 150, =*nevadensis.*
1885—Neum., Ent. Amer., I., 93, =*nevadensis.*
var. *sulphurica* Neum. Ent. Amer., I., 93, *Arctia.*
ochracea || Neum.

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1883—Neum., Papilio, III., 71, *Arctia.*
1885—Neum., Ent. Amer., I., 93, *nomen bis lectum.*
var. *mormonica* Neum.
1885—Neum., Ent. Amer., I., 93, *Arctia.*
Habitat—Nevada, Arizona, Oregon, Calif.

As I have already indicated, I believe that *geneura* Strk. belongs to this series.

A. obliterata Stretch.
1885—Stretch, Ent. Amer., I., 105, *Arctia.*
Habitat—Unknown.

A. ochreata Butler.
1881—Butler, Ent. Mo. Mag., XVIII., 135, *Arctia.*
Habitat—United States.

Mr. Butler says his species is close to *phalerata*, and after carefully reading his description I believe he is right. At all events I cannot find anything in it that does not apply to *phalerata* as well.

A. oithona Strk.
1877—Strk., Lep. Rhop. et. Het., 131, *Arctia.*
Habitat—Texas.

This will turn out a remarkably close ally to *intermedia* Stretch, which *is not saundersii* Grote.

A. pallida Pack.
1864—Pack., Proc. Ent. Soc., Phil., III., 118, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
Habitat—New York.

The type is in the collection of the Am. Ent. Soc., where I have several times seen it. It is certainly not an *Arctia*, but perhaps nearer to *Seirarctia.*

A. phyllira Dru.
1770—Drury, Illustr., I., 15, pl. VII., f. 2, *Bombyx.*
1791—Oliv., Enc. Meth., V., 94, *Bombyx.*
1797—Abb. & Sm.,* Ins., Ga., II., 127, pl. 64, *Phalæna.*
1816—Hübner, Verzeichniss, 180, *Euplagia.*
1820—Hübner, Zutraege, *108, ff. 215, 216, *Euplagia.*
1837—Westw., ed. Drury, I., 15, *Callimorpha.*

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1837—Harris, Cat., Ins., Mass., 73, *Arctia.*
1841—Harris, Rept. Ins. Mass., 245, *Arctia.*
1856—Wlk., C. B. Mus. Lep. Het., III., 610, *Arctia.*
1858—Wlk., C. B. Mus. Lep. Het., VII., 1780, *Arctia.*
1860—Clem., Proc. Ac. N. Sci. Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morr. Synops., 339, *Arctia.*
1862—Harris, Inj. Ins., Flint ed., 347, *Arctia.*
1863—Saund., Syn. Can. Arct., 11, *Arctia.*
1876—Moeschl, Stett. Ent. Zeit., XXXVII., 296, *Arctia.*
1883—Hulst., Bull. Blkn. Ent. Soc., VI., 70, =*nais.*
1887—Smith, Ent. Amer., III., 111. an spec. dist.
var. *lugubris* Hulst.
1886—Hulst., Ent. Amer., II., 182, *Arctia.*
Habitat—Penn., N. Y., N. J., D. C., Can., Mass., Ills., Mo., Ga.

The distribution is wider—when the synonomy is once ascertained we can complete the record of occurences.

(To be continued.)

DESCRIPTION OF THE LARVA OF TRIRHABDA TOMENTOSA, L.

BY WM. BEUTENMÜLLER.

Body elongated, subcylindrical, rounded above and flattened beneath; color above steel blue, with a series of transverse elevated ridges along the dorsum, two on each segment, and along the sides are three rows of tubercles, all steel blue. Body beneath, dirty brownish white; cervical shield also steel blue.

Thoracic feet jet black, shiny; abdominal and anal legs wanting.

Head small, subglobose, depressed in front; shiny jet black.

Mandibles simple, short, stout, slightly excavate internally beneath the apex.

Maxillæ robust, cylindrical; lobe rounded at the apex with a few bristles; palpi three jointed; first joint short, second joint somewhat larger, cylindrical, third joint conical, extending a little beyond the lobe.

Labium subtriangulate, palpi two-jointed, very short.

Antennæ very minute, hardly visible.

Length, about .10 mm; width, about .3 mm.

Food-plants, various species of golden rods and asters. June; single brooded.

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NOTES ON THE INSECT FAUNA OF HIGH ALTITUDES IN CUSTER COUNTY, COLORADO.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COL.

The faunæ of high altitudes always possess a peculiar interest by virtue of the light they throw on problems of geographical distribution, and especially the distribution in ancient times of what is now a strictly Arctic and Alpine fauna. For this reason, the following lists of species, fragmentary as they are, may be of some value as a contribution to our knowledge of the Alpine fauna of Colorado, and for comparison with Arctic and Alpine faunæ in general. The species here enumerated were taken in 1887, 1888 and 1889, on the eastern slope of the Sangre de Cristo Range, in Custer County, Colorado. Three gulches have been explored, namely, (1) Smith's Park Gulch, on a fork of Brush Creek, (2) Horseshoe Bend Gulch, the next gulch south of No. 1, and (3) Swift Creek Gulch. The great majority of insects came from Smith's Park Gulch. The altitudes are from 10,000 to 12,000 feet. A large number of insects were taken about the Micawber Mine, which is possibly not quite 10,000 feet; but it cannot be far from it, so the species are included. A list of the fauna and flora of the same part of Custer County, *below* 10,000 feet, is now in course of publication in the "West American Scientist." A comparison of the two lists will show that the fauna of higher altitudes differs very materially from that of the valley:—

COLEOPTERA.

These have been kindly identified by Dr. John Hamilton. They are classified according to locality and date of collection:—

(1) Near Brush Creek, June 26 and 27, 1889—

Dolopius lateralis Esch.
Podabrus lateralis Lec.
Orsodacna atra var. *childreni* Kirby.
Cicindela longilabris Say.
Acmæops proteus Kirby.
Adoxus vitis L.
Dichelonycha backii Kirby.

O. childreni and *D. backii* were common. *A. vitis* had the thorax black, and elytra reddish-fulvous.

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(2) Near Micawber Mine, 1889—
Chrysobothris trinervia Kirby. A small example.
(3) Horseshoe Bend Gulch, August 15—
Chrysomela continua Lec. Many specimens on flowers of *Gymnolomia multiflora.*
(4) Near Micawber Mine, Aug.—
Lachnosterna sp. ♀ (fragment).
Coccinella transversoguttata Fald.
Trichodes ornatus Say.
Buprestis nuttallii? (flying by day; not caught).
(5) Micawber Mine, Aug. 7, 1889—
Acmaeops pratensis Laich.
Adoxus vitis L.
Zeugophora abnormis Lec.
Anthobium sp.
Mordella melæna Germ.
Leptura propinqua Bland.
" *subargentata* Kirby.
Anaspis rufa Say.
Homalota sp.
Mordella scutellaris Fab.
(6) Smith's Park Gulch, Aug. 5—
Cardiophorus tenebrosus Lec.
(7) Near Micawber Mine, Aug. 4—
Leptura propinqua.
Athous ferruginosus Esch.
(8) Timber line above Smith's Park Gulch, Aug. 5—
Dasytes hudsonicus Lec.
(9) Near Micawber Mine, Aug. 6—
Phyllotreta pusilla Horn. n. sp.
Hippodamia convergens Guér.
Glyptina atriventris Horn, n. sp.
Platystethus americanus Erichs.
Leptura propinqua Bland.
Adoxus vitis L.
Leptura subargentata Kirby.

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HYMENOPTERA.

All the Hymenoptera have been submitted to Mr. W. H. Ashmead. The types of the new species are in his collection, and will be described by him.

(1) Near Brush Creek, June 27, 1889—

Bombus rufocinctus Cr.
Prosapis basalis Smith, ♂.
Oryssus occidentalis Cr.
Rhodites spinosellus Ckll., n. sp.
Limneria tibiator Cr.
Odynerus leucomelas Sauss.
Macrophya albipictus Ashm., ♂, ♀.
Camponotus sp.
Orthocentrus leucopsis Ashm.
Eurytoma diastrophi Welsh, ♀.

Of *R. spinosellus* only the round pickly leaf-galls were found.

(To be continued.)

CORRESPONDENCE.

CHRYSALIDS DEVOURED BY CATERPILLARS.

Dear Sir: A few days ago I found a number of *Pyrameis cardui* larvæ, and also several (4) of the common, reddish brown, hairy caterpillars *(Spilosoma Isabella)*, so often seen about gardens in the fall feeding on plants of the common garden hollyhock (Altheæ rosea). Not having extra boxes to spare, I placed both species in a roomy pasteboard box, with a plentiful supply of hollyhock leaves. In the course of a day or two several of the *cardui* larvæ hung themselves to the corner of the box, and in a short time three were transformed to chrysalids. What was my surprise on looking into the box this morning to see if any more had hung or transformed, to find the reddish brown caterpillars had devoured two of the *cardui* chrysalids, and one of the caterpillars was actually engaged eating the third, and had consumed fully one-half of it. This was not done from lack of food, as there was an *abundance* in the box. Here, then, is a new source of destruction to our butterflies—a sort of cannibalism among caterpillars.

SHELLY W. DENTON, Wellesley, Mass.

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EREBIA EPIPSODEA VAR. SINE-OCELLATA Skinner.

Dear Sir: Is not this variety (CAN. ENT., p. 239) identical with var. *brucei* Elwes, (Trans. Ent. Soc. Lond., 1889, June, p. 326), described as smaller, without ocelli, the red band almost obsolete? *Brucei* was described from high altitudes in Colorado, so it is interesting to have it reappearing at lower levels in N. W. Ter. Mr. W. H. Edwards has kindly sent me the *Epipsodea* plate of his Butt. N. A., whereon are beautiful figures of *Brucei* and the early stages of the species.

Dec. 16, 1889. T. D. A. COCKERELL, West Cliff, Custer Co., Col.

GRAPTA INTERROGATIONIS.

Dear Sir: I beg to record the capture by myself of a beautiful specimen of *Grapta interrogationis* at Cote St. Antoine, Montreal, on the 11th of July. Its sluggishness and perfect condition showed that the insect had but just emerged from the chrysalis. *G. interrogationis* is extremely rare in the Province of Quebec. Tradition says that it had been, once upon a time, taken at Lachine—a few miles away; but for twenty-five years I have looked vainly for it.

South Quebec, Oct. 16, 1889. THOMAS W. FYLES.

THE CORN SAW-FLY.

Dear Sir: The occurrence in America of *Cephus pygmæus* Curtis, known in England as the Corn Saw-fly, may be worth a special record. In 1887, among insects taken by sweeping in a meadow, I found a *Cephus* not agreeing with any of the described American species. Mr. Ashmead has fully identified it as *C. pygmæus.* In some Hymenoptera received from Mr. VanDuzee a few days ago, I find three specimens, all females, and taken at Buffalo—two on 9th June, 1888, and the other on 11th June, 1889. This shows that the occurrence of the species is not accidental, and that it is already widely distributed. Possibly next season we may hear of injuries inflicted by it upon wheat fields.

W. HAGUE HARRINGTON, Ottawa.

Mailed February 4th.

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The Canadian Entomologist.

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POPULAR AND ECONOMIC ENTOMOLOGY.

THE MEDITERRANEAN FLOUR MOTH (*Ephestia kühniella*, ZELLER).

BY JAMES FLETCHER, OTTAWA.

During the summer of 1888 considerable anxiety was caused amongst North American millers by the alarming intelligence that the small Pyralid-moth, bearing the name given above, had made its appearance in one of our large Canadian milling centres. There are two or three well-known insects which attack manufactured cereal products; but none of these, have ever occurred in injurious numbers in Canada. When, therefore, it was learned that a large warehouse, twenty-five feet wide, seventy-five feet deep and four stories high, had been completely over-run by the caterpillars of a new insect, which had infested all the flour and other manufactured foods therein contained, and had rendered much valuable machinery temporarily useless, it naturally caused much excitement lest the pest should spread to other mills; nor did this excitement abate when it was announced that the new comer was the same species as had been causing so much loss and trouble in English and European mills during the last ten years. The attack was so severe that it became necessary to close the mill where the outbreak occurred, and also to destroy a large quantity of goods. The insects in all stages were to be found in every part of the building. The cocoons were found adhering to the walls, joists, shelves and ceiling. Every crack or nail hole in the wood-work, machinery and furniture throughout the whole building was found to contain caterpillars or cocoons, and the moths were flying about in thousands. The attention of the Ontario Government was called to

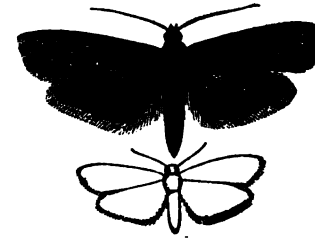

FIG. 2.

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the matter in August last, and, under instructions from the Hon. Charles Drury, the Minister of Agriculture, prompt and vigorous steps were taken by Dr. P. H. Bryce, Secretary of the Provincial Board of Health, to ensure the extermination of so dangerous a visitor, which has been described as "the scourge of the Mediterranean ports." Dr. Bryce's investigations and the methods he adopted have been published in Bulletin I. of the Provincial Board of Health. This pamphlet, which is written in a clear, intelligible manner, and is illustrated with figures* of the insect in its various stages, will certainly be of great use to millers in showing them how to recognize and wage war against the insect should they meet with it upon their premises. Other valuable sources of information on this subject are Miss E. A. Ormerod's article in her Twelfth Report (pp. 66-72), and Prof. Riley's article in "Insect Life" (Vol. II., pp. 166-171). The object of the present note is to draw the attention of our readers to the subject, so that the gravity of the case may be recognized and prompt advice sent either to our Society or to the Ontario Government in case of further outbreak occurring in other parts of the Province. The perfect moth is a slender species about half an inch in length, with the wings folded close to the body when at rest. The upper wings are of a leaden grey colour, more or less sprinkled with black scales and crossed by three waved dark lines, two near together at the tip and the other a little nearer the shoulder than the middle of the wing. Just beyond the middle and in the centre of the wing is a black dot (sometimes two). The under wings are greyish-white, edged by a dark line, and all the wings are conspicuously fringed. The eggs, which are about $\frac{1}{40}$ of an inch in length, are oblong, bluntly rounded at the ends, or sometimes rather kidney-shaped. Under the microscope they are pretty objects, being covered with rather large but indistinct star-shaped prominences, the rays (or wrinkles) of which are waved. As a rule the eggs are laid singly, but sometimes in strings of from three to fourteen, connected at their ends. In nature they are probably laid on the outside of sacks, or are possibly pushed in between the meshes by means of the long ovipositors of the females. One female confined in a glass bottle closed with a plug of cotton batting had forced her eggs into the cotton plug to a depth of over $\frac{1}{4}$ of an inch. When first laid the eggs are greenish-

*Fig. 2, showing *E. kuhniella* enlarged, and of the natural size in outline, is kindly lent by Dr. Bryce.

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white, after about twelve days they turn purplish, and in nineteen days (in September and October) the young caterpillars eat their way out of the eggs.

When first hatched they are reddish-brown, with dark heads, slender, hairy, and very active. They at once begin to spin a silken thread wherever they go. When full grown the caterpillar is three-quarters of an inch in length, slender and cylindrical; of a greenish-white, but pink where the skin overlaps. The head is reddish-brown. Upon the segment next to the head, and on the last segment, are two chitinous plates of a honey-yellow colour, known, respectively, as the thoracic and anal shields. Along the sides of the body are four rows of dark piliferous tubercles, the most distinct of which are those upon segments 2, 3 and 13. These tubercles are arranged in four series, as follows:—Subdorsal (two on each segment, from 5 to 12), lateral, substigmatal, and supraventral. The substigmatal series is double throughout, each tubercle bearing two bristles, separated a little at the base. On segments 3, 4 and 13 the subdorsal and lateral series are represented by a single double tubercle instead of two separate tubercles, as on the other segments.

These tubercles are small but distinct, the dark colouring is in the form of a cloud round the bases of the bristles. On the anterior section of segment 13, the two subdorsal rows of tubercles are joined by a dark cloud, and there is a large double conspicuous tubercle in the lateral area, When full-grown the caterpillars crawl to some crevice or corner and enclose themselves in close cocoons, into which they spin particles of flour dust, or any other material at hand. The chrysalis is honey-yellow at first, but turns darker as the moth matures within it. In about three weeks the moths appear, pairing takes place and eggs are laid within 24 hours.

Remedies.—As to remedies, these will have to be applied according to circumstances. In the attack above referred to, all machinery was brushed and subjected to a blast of super-heated steam. Fumigation, with sulphur and chlorine, was also resorted to. The experience of all who have had the misfortune of being visited by this pest is, that the only safeguard is scrupulous cleanliness. In Canada, where we have several months consecutively of severe winter weather, there should be no very great difficulty in keeping this pest down if millers will only recognize the danger of being indifferent. It is hardly probable that cold will kill

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the insects if they are left undisturbed in their silken tunnels; but, if these are broken by constant sweeping, and the caterpillars are left exposed, cold will certainly injure them. Moths and caterpillars placed in a glass bottle, and exposed to a temperature of five degrees above zero (Fah.), were all severely crippled, and did not recover. The above facts suggest the advisability of occasionally opening mills, which are supposed to be infested, so that the cold of winter may penetrate. If the moths are seen about in spring, fumigating with sulphur at short interval must be practised. Old sacks received from outside sources should be carefully examined, as these would probable be the most frequent means of carrying the pest from one mill to another. It is probable that this insect passes the winter in the caterpillar state, in which it is more or less active, according to the temperature.

SOME NEW COLORADO MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Cossus Brucei, nov. spec.

Expanse, male 2.50, female 3.00 inches.

Ground color, very pale gray, almost white, no dusky shading over the wing. Fore wings crossed by a great number of fine black lines. In the male none of these form reticulations except a few along the basal half of the internal vein and near the outer margin. The female has a few more of the reticulations in the outer third of the wing. On the male one line more prominent than the rest crosses the wing through the middle from the costa to the posterior margin at the origin of the fourth median vein, forming a straight line. On the female this line follows the fourth median vein about a tenth of an inch, and then goes in a straight line obliquely to the margin, and is not so heavy as in the male. Both sexes have a subterminal line not quite so prominent as the median, from near the apex to the posterior angle, bifid on costa, nearly straight in the male, slightly curved outwardly in the female, reaching the angle in a fine line. Veins dark only as denuded. Hind wings, with a space at the base and along

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the inner margin, covered with long hairs as usual, the rest reticulated; of the same color as the fore wings.

Head gray, darker in the male; colar slightly more buff tinted than the ground color of the wings, making a light drab, without marks; thorax gray, a mixture of the ground color of the wings and black, a black line round the posterior margin preceded by a space devoid of black; abdomen of a lighter gray than the thorax. Beneath the thorax and abdomen concolorous with the same parts above, the legs ringed with light.

This species is nearest to *Cossus Angrezi* Bailey, but differs from that in several particulars. It lacks the dark shading on the fore wings, in the shape and distinctness of the transverse median line on fore wings, and in the shape and position of the subterminal line. The fore wings are a little less rounded at the apices, otherwise they are shaped alike. The hind wings in this species are reticulated over the terminal two-thirds, while in *Angrezi* the reticulations do not cover quite half. In *Angrezi* the thorax is black, with the edge of the tegulæ shaded with yellowish gray; in this the thorax and tegulae are both gray. The antennæ are pectinated in both sexes, most heavily so in the male. The under side of the wings repeat the markings of the upper side, but a little blurred. The space between the two transverse lines is a little shaded with brownish. The female has the ovipositor exserted about .30 of an inch.

Described from two examples, one of each sex, taken by David Bruce, in Colorado, in 1887, and in the name dedicated to him.

Tolype distincta, nov. spec.

Expanse, male 1.12½, the female 1.50 inches.

Male.—In color and markings between *Velleda* and *Laricis*, rather a dark leaden gray; the fore wings crossed by two geminate lines and a subterminal line, similar to those of *Velleda*, but the subterminal line is also inclined to be geminate. These lines are lighter than the ground colour, but not white as in *Velleda*. The geminate lines bordered each side by a shade line that is slightly brownish; fringes concolorous, a whitish gray line at the base. Hind wings nearly the color of fore wings, a pale shade through the middle and at the outer border; fringe like that on fore wings.

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Head and thorax gray, the front a little mixed with brown, the middle of thorax with the usual glossy brown scales in the form of a longitudinal crest; abdomen gray, brown tinted, the sides at the base white, beneath a little paler than above; antennæ strongly pectinate.

Female.—Color and markings as in the male, the bands and veins a little more decided in contrast of color with the wings. Thorax dark leaden gray, patagiae rather lighter gray than the wings; the entire absence of white anywhere.

This species is between *Velleda* and *Laricis* in size, as well as markings and colour. The antennæ are strongly pectinate, more so than *Laricis*, but not so much as *Velleda*. There is no decided white on either sex, except on the sides of the abdomen of the male, the cross bands and veins of the fore wings being whitish gray. The fringe of the fore wing show a tendency to be paler at the ends of the veins, but they are not pale externally, as are those of *Velleda*.

Captured by Mr. David Bruce, in Colorado, and described from two males in my cabinet, and one female in that of Mr. Bruce.

Halisidota occidentalis, nov. spec.

Expanse, 1.30 inches.

Fore wings hyaline, except the anterior part to subcostal vein, the base, and the posterior part along the submedian vein and a little above that at the base. The costal space alternately four patches of yellow, between a buff and a chrome yellow, and yellowish brown; the posterior margin alternately two spots each of the yellow and brown, the basal yellow and the terminal brown spots the longest. From the costal brown spots three irregular sub-hyaline brown bands extend across the wing, the two outer connecting with the two brown spots on the posterior margin, the third from the outer margin not reaching the margin but blended posteriorly with the second; the sub-basal brown spot on the costa is in line with a red-brown spot on the median vein at base; the subhyaline brown, is darker than that on the costa. The hyaline spaces left between these brown bands corresponds to the light bands in such species as *Agassizii*, etc. Veins brownish yellow, as also the extreme outer portion of the wing. Hind wings hyaline, immaculate; fringes of both wings pale.

Head pale yellowish brown, a yellow transverse stripe in front, antennæ

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pectinate, pale yellow-brown. Thorax yellow buff; collar, a dorsal line and a line on outer edge of patagiae brown, the edge of collar next to head yellow; abdomen yellow; beneath pale yellow, with the front of anterior legs brownish.

Described from one male taken by Mr. Bruce, in Colorado.

Halisidota subalpina, nov. spec.

Expanse, 1.55 inches.

Fore wings yellow-buff, so sprinkled with brown scales as to appear quite brown, crossed by six rows of spots that are part yellow and part white, all except the costal surrounded by a brown annulus. The first row is of two spots, the first on costa and the second on median vein, all yellow; the second row is of three, the first large and at right angles to the other two very small white ones; the third row is of five spots, the costal yellow, the next three white, the second very small, the third and fourth equal, the fifth yellow and lacking the basal part of annulus; the fourth row is of five spots, the costal yellow, the second large and in the cell white, the third a brown spot, the other two small, white; the fifth row of six spots all white except the costal, the first and second only separated by the vein, the sixth very small; the sixth row is of nine spots, all white but the costal, the first, second and ninth very small, the seventh and eighth tending to fuse, the ninth removed inward out of line with the others. The last spot in four of these rows is below the submedian vein. Fringes brown, with buff at the ends of the veins. Hind wings pale buff, a pale stain spot at the end of cell and at the apex.

Head yellow in front, brown between the antennæ, antennæ pale yellow brown; collar buff, a central line and a spot each side brown; thorax buff, a brown line each side of the centre; centre of patagiae pale buff, with a brown line each side, the two uniting in front; abdomen buff. Beneath similar to the upper but paler, the abdomen with a central and lateral brownish stripe, the costa of hind wings with three brown stains.

Collected in Colorado by Mr. David Bruce. Described from one male. This species is near *H. Scapularis* Stretch, but differs in size, colour and markings. In *Scapularis* all the spots are white, and the ground color is brown, with the thorax brown instead of buff. These are a few of the differences between the two species.

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NOTES ON EREBIA EPIPSODEA, BUTLER.*

Epipsodea was first known to me by examples taken by Mr. T. L. Mead, in Colorado, 1871. He says, in Report of the Wheeler Expedition: "This species inhabits the mountains of Colorado below timber line. Specimens were brought from Fairplay by the Expedition. It begins to appear about the first week in June, is common by the middle of that month, and remains until the last of July."

Several examples were received in 1883, by Mr. William M. Courtis, from Judith Mountains, Montana, at about 4,000 feet elevation, in July. From Mr. Ernest Stevenson, at Walla-Walla, southeast Washington, came some unusually large specimens, late in June, 1885; others from Spokane Falls, in east Washington, by Dr. W. J. Holland. I have also received this species from St. Michaels and Nushagak, Alaska; and have received eggs from Mr. Thomas E. Bean, at Laggan, Alberta. On the other hand, I have not seen *Epipsodea* from south Colorado, or New Mexico, or Arizona, or Utah, nor from the Sierra Nevada range anywhere. So far as appears, it is confined to the Rocky Mountains from middle Colorado northward to the Arctic sea, but flies over the lowlands in its northernmost range, and may there have a wide distribution. Many examples from Colorado are small, the wings expanding less than any seen from Alaska; and the largest have come from Washington. Throughout its territory the two principal varieties seem to be found, the banded and not banded.

Mr. Butler described the species from two individuals "from Rocky Mountains," but the locality was not stated.

Mr. Bruce writes: "I first met with *Epipsodea* in Platte Canon, Colorado, at about 9,000 feet elevation. It frequents damp and boggy places where the grass grows rank and coarse. In such situations, up to nearly 12,500 feet, I found it rather common. In one place, at the highest altitude named, a small stream of muddy water from a mine had been conveyed in wooden troughs which emptied into a basin-like depression; in this place, being always moist, the grass and flowers grew luxuriantly, and many species of butterflies were in profusion. *Epipsodea* was plenty, and in almost all the examples I captured here, the ocelli on

*From Edwards's Butt. N. A., Vol. 3, Part IX., issued Feb. 1, 1890. As comparatively few of our readers are likely to see this work, we have thought it worth while to reprint these interesting notes.—Ed. C. E.

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upper wings were absent. Many had none on lower wings, others showed black points more or less minute.

"This variety, which Mr. Elwes has called E. Brucei I see, is probably peculiar to these high stations, where I have found it during three seasons, for, in the valley below, there was a narrow, boggy tract, more than a mile long, where *Epipsodea* was plentiful; but I found none of the variety spoken of. The only variation there was marked by the absence of the band on under side hind wings, and this was confined to few individuals.

"*Epipsodea* has a rather quick, jerky flight. It is not very readily captured, for, although it never appears to be in a great hurry, it flies close to the ground, and is always just ahead, dodging under every bush, and around every grassy hummock, as if in earnest search for something. It takes long flights without going far away, and seldom alights on flowers. Directly the sun is obscued, it dives in the grass, like almost all the mountain diurnals. All the Erebias, as well as the alpine species of Chionobas, 'play possum,' and pretend to be lifeless when captured, and will lie in or under the net, or on one's hand, some moments in that condition. I have found *Epipsodea* from June 9th to the end of August, in the front Range, in Colorado; at the latter date it was badly worn."

Mr. Elwes says, Tr. Ent. Soc., Lond., 1889, Part II, p. 334: "I have a single specimen, and Mr. Godman has a similar one, collected by Bruce in Cashier Valley, Summit County, Colorado, at 12,000 feet, which are considered by Bruce and W. H. Edwards to be a variety of *Epipsodea*, though it is so different from it that, had I more specimens, I should be inclined to consider it a different species, more especially as *Epipsodea* does not appear to extend to such great elevations, or to vary much; though its range of altitude is very great. I have taken it in Idaho at about 2,000 feet elevation, and in the Yellowstone Park at 5,000 to 6,000 feet, and have it from Colorado, taken by Bruce, as high as 9,500 feet. The specimens above mentioned are somewhat smaller, and with rounder wings, than the average of *Epipsodea*, but are best marked by the entire absence of ocelli on either wing or on either surface, and the partial disappearance of the red band." In the Synopsis of same paper, page 326, Mr. Elwes puts this under the species name as "? Var. Brucei."

Mr. Bean writes: "At Laggan, *Epipsodea* is moderately common in June and early July, frequenting open, grassy flats of the Bow River valley,

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at an altitude of about 5,000 feet. It is, in my experience, rarely found on the mountains, but I took a single male, the past seaon on a mountain ridge, at 7,800 feet, or about 500 feet above the tree line. This specimen does not differ from those of the valley, 3,000 feet below. The form you mention *(Brucei)*, which partly lacks the eye spots, I do not find.

"*Epipsodea* occurred at McLean, altitude 1,900 feet, in 1884, though not so common as it is at Laggan, and the localities were open grassy flats."

The eggs sent me by Mr. Bruce, in 1888, were laid by a female of this var. Brucei, not wholly destitute of spots, there being two or three black points on fore wings. The outcome was a single male, true type *Epipsodea*, scarcely banded beneath, out of chrysalis 12th May, 1888. The eggs were laid 8th July and hatched 20th. On 25th, there were seven young larvæ. The first one passed first moult 27th July, the second moult 4th August, the third moult 28th August. The others lingered in their stages, but by 15th September, five had passed third moult. They were at all times kept out of doors, and cool weather now coming on they ceased feeding gradually. On 29th October, I found but three larvæ, all in lethargy, two of the five having disappeared. In November, I took them to Clifton Springs, as before stated. On 5th April, 1888, I received them again, two alive and wide awake as I opened the box. These were at once placed on grass, and in five minutes thereafter were feeding. On 15th April, one passed its fourth moult, the other on 17th. On 30th April, I noticed that one was bringing together leaves of the grass and forming a sort of loose cylinder. It was in the middle of a pretty dense tuft, the leaves of which were three to four inches long. On one of these the larva rested, holding by its prolegs, and was spinning a few threads and drawing the leaves down and about it. Before night the inclosure was complete. Nearly a score of leaves were held, mainly by threads at top and bottom, that is, above and below the larva, making a pretty close covering, but open by spaces so that most of the side, and the head, were exposed to view. The larva rested head up, back arched. Mr. Scudder, in But. N. E., has well characterized this structure as "an imperfect cocoon." Pupation took place on the night of 1st–2d May. Some hours after, when the chrysalis had hardened, I cut away the leaves one by one. There were fifteen of them, and the pupa rested upright, its lower end one and a-half

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inch above ground, in an angle formed by three leaves. As I cut one of these, it turned over and fell, showing itself to be unattached. In fact the cremaster was found to be furnished with but straight bristles, very short, and there were no hooks by which attachment could be had. As before stated, a male of the typical form came from this chrysalis on 12th May.

I had received young larvæ of this species from Mr. Bean, at Laggan, 25th July, 1886, they having hatched *en route*. I lost all but one of these. It passed first moult 2d August, the second moult 10th August, and soon after became lethargic. I kept it at Coalburgh, and brought it into the house middle of January, 1887, apparently healthy. But a month later it unaccountably disappeared.

Mr. Bruce had also sent eggs from Colorado which reached me 28th July, 1886. From these, five larvæ reached second moult, and went into hibernation, and died during the winter. From the behavior of the different lots of larvæ, it apears that hibernation may take place at either second or third moult.

This, therefore, is the complete history of an Erebia from egg to imago, and, so far as I know, the first such that has ever been published of one of the genus. To get drawings of the several stages, it was necessary to send them to Mrs. Peart, at Philadelphia, through the mails, some five hundred miles, with risk of loss or damage. Indeed, the second larva was in Philadelphia in its last stage, and being returned to me, imperfectly pupated on the way, and died.

The genus Erebia comprises many species, nearly all of which are European and Asiatic. Dr. Staudinger, in 1871, enumerated forty-eight, many of them boreal, others alpine, the latter found as far to the south as the Pyrenees, Alps, Caucasus, and Himalayas. Great Britain is credited with three species, and, in Buckler's Larvæ of British Butterflies, Vol, I, on. Plate VI, are figured the mature larva and pupa of one of these, E. *Blandina*, and the young larva of another, E. *Cassiope*. In the text, Mr. Buckler relates that he raised the larva of *Blandina* from the egg, obtaining pupa and imago; and a brief description of the several stages is given, that of the larval being imperfect, as nothing is said of the several moults. Nor is it told how the larva pupated. Nevertheless, the plate represents the pupa resting nearly upright on a tuft of grass, but not at all inclosed. It looks very much like the pupa of *Epipsodea*. So an incomplete des-

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cription is given of the stages of *Cassiope*, but how pupation took place is not told, nor is there a figure shown. The young larva as figured has forked tails, and therefore, I apprehend, it must have been drawn after the first moult.

In North America, are eight or nine species, three at least of which are said to be old world, namely, *Tyndarus*, *Discoidalis*, and *Disa*. One species heretofore erroneously credited to North America, on the authority of Doubleday, E. *Vesagus*, belongs to the Andes, in South America.

The group is a very interesting one, and together with Chionobas, and some others, embraces those members of the Rhopalocera, or Diurnals, which are nearest the Heterocera, or Moths, allied to them in important characters in each of the four stages. The resemblances of the larvæ and pupæ are particularly striking. The latter are destitute of cremastral hooks in Erebia, in Chionobas, even of bristles, and pupation takes place, sometimes on the bare ground, sometimes in or on the sod, in one case, as we have seen, in an imperfect cocoon; sometimes in a real cocoon beneath the surface of the ground; or the larva goes into the ground and pupates naked, in a cavity made by the movements of its body, after the manner of nearly all the Sphingidæ.*

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 36, Volume xxii.)

A. placentia A. & S.

1797—A. & S.,* Ins. Ga., II., 129 pl., 65, *Phalaena.*

1816—Hübner, Verzeichniss, 180, *Heraclia.*

1856—Wlk., C. B. Mus., Lep. Het., III., 610, *Arctia.*

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 529, *Arctia.*

1862—Clem., App. to Morris, Syn. 337, *Arctia.*

1863—Saund., Syn. Can. Arct. 5, *Arctia.*

*NOTE.—Since the foregoing paper was printed, I have seen the CAN. ENT. for December, 1889, and learn therefrom (Vol. XXI., p. 238,) that Dr. H. Skinner has received examples of *Epipsodea*, caught in Assiniboia, about 325 miles west of Winnipeg, and with them one of the var. *Brucei*, mentioned as var. *Sine-ocellata.*

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1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, = *nais.*
1883—Neum., Papilio, III., 150, *an sp. dist.*
Habitat—Georgia, Canada.

A. quadrinotata Strk.

1878—Strk., Proc. Dav. Ac. N. Sci., II., 271, pl. IX., f. 6.
Habitat—Texas.

A. quenselii Geyer.

1830—Geyer, Zutr. No. 424, ff. 847–848, *Arctia.*
1849—Moeschl, Stett. Ent. Zeit. IX., 173, 174, *Euprepia.*
1856—Wlk., C. B. Mus., Lep Het, III., 611, *Arctia.*
1858—Wlk., C. B. Mus., Lep. Het., VII., 1780, *Arctia.*
1860—Clem., Proc. Ac. N. Sci. Phil, XII, 527, *Arctia.*
1862—Morris, Synopsis, 223, *Arctia.*
1864—Gn., Ann. Soc. Ent. Fr. 1864, 4e trim., *Nemeophila.*
1866—Pack., Proc. Bost. Soc. N. H., XI., 34, *Arctia.*
1873—Stretch, Zyg. and Bomb, 74 et 222, pl. IX., f. 8 (♀).
1874—Pack., *Rept. Geol. Surv., 1874, 558, f. 14 (larva).
1887—Smith, Ent. Amer., III., 109, *Arctia.*
gelida Moeschl.
1849—Moeschl, Stett. Ent. Zeit., IX., 174, *Euprepia.*
1856—Wlk., C. B. Mus., Lep. Het., III., 611, *Arctia.*
1860—Clem., Proc., Ac. N. Sci. Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morris Syn., 341, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1873—Streck., Lep. Rhop. et Het., 23, pr. syn.
1883—Moeschl., Stett. Ent. Zeit., XLIV., 116, pr. syn.
1883—Neum., Papilio III, 150, pr. syn.
Habitat—Labrador, White Mts., Col.

A. rectilinea French.

1879—French, CAN. ENT., XI., 45, *Arctia.*
1887—Smith, Ent. Amer., III., 110, *Arctia.*
Habitat—Illinois, New York.

A. remissa Edw.

1888—Edw., Ent. Amer., III., 184, *Arctia.*
Habitat—H. B. Terr.

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A. rhoda Butl.

1881—Butler, Ent. Mo. Mag., XVIII., 135, *Arctia.*

Habitat—United States.

This species bears the same relation to *ochreata* Butl. that *decorata* Saund. does to *nais* Dru., and Mr. Butler suggests that it may be the female of either *phalerata* Harr., or *ochreata* Butl.

A. saundersii Grt.

1864—Grt., Proc. Ent. Soc., Phil., III.. 75 et 324, pl. 4, f. 3, ♂, *Arctia.*

1868—Saund., CAN. ENT., I, 27, *Arctia.*

1873—Stretch, Zyg. and Bomb., 74. *Arctia.*

1881—Butler, Papilio, I., 131, *Arctia.*

1883—Hulst, Bull. Bkln. Ent. Soc., VI., 71, *parthenice.*

1883—Neum., Papilio, III, 149, an sp. dist. *parthenice.*

1887—Grt., Ent. Amer., III, 147, *Arctia.*

1887—Grt., CAN. ENT., XIX., 32, an sp. dist. *parthenice.*

virguncula ‡ Saund.

1863—Saund., Syn. Can. Arct., 9, *Arctia.*

1864—Grt., Proc. Ent. Soc., Phil., III., 75, pr. syn.

intermedia Stretch.

1873—Stretch, Zyg. and Bomb., 216, pl. IX., f. 3, *Arctia.*

1875—Grt., CAN. ENT., VII., 197, pr. syn.

1883—Neum., Papilio, III., 150, an sp. dist.

1887—Smith, Ent. Amer., III., 110, an sp. dist.

Habitat—Can , N. Y., Mass., N. J., Ills.

Mr. Stretch's species *intermedia* is certainly not referable to *saundersii*, but to *stretchii* Grt. and *oithona* Strk.

A. simplicior Butler.

1881—Butl., Ann. and Mag., N. H., ser. 5, VIII., 311, *Arctia.*

"Possibly a well marked variety of *A. achaia*; but apparently intermediate between that species and *A. saundersii.*" So says Mr. Butler.

Habitat—Oregon.

A. snowi Grt.

1875—Grt., CAN. ENT., VII., 197, *Arctia.*

1883—Hulst., Bull. Bkln. Ent. Soc., VI., 70, =*nais.*

Habitat—Kansas.

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A. shastaensis Behrens.

1889—French, CAN. ENT., XXI., 35, *Arctia.*

1889—French, CAN. ENT., XXI., 162, fig. ♀, *Arctia.*

Habitat—Mt. Shasta District, Cal.

A. speciosa Moeschl.

1865—Moeschl., Wien. Ent. Monatschr, VIII., 195, pl. V., ff. 13–14 *Arctia.*

1866—Pack., Proc. Bost. Soc. N. H., XI., 34, =*queneselii.*

1873—Strk., Lep. Rhop. et Het., I., 23, *Arctia.*

1874—Pack., Rept. Geol. Surv., 1874, 558, *queneselii* var.

1883—Neum., Papilio, III., 150, =*queneselii.*

Habitat—Okak, Labr., White Mts.

(To be continued.)

NOTES ON THE INSECT FAUNA OF HIGH ALTITUDES IN CUSTER COUNTY, COLORADO.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COL.

(Continued from page 39, Volume xxii.)

(2) Near Micawber Mine, Aug. 6—

Lysiphlebus salicaphidis Ashm.

Lipolexis chenopodiaphis Ashm.

Limneria montana Cr.

Periclistus sp.

Apanteles sp.

Diaeretus atricornis Ashm.

Megachile sp.

Andrena sp.

Halictus sp.

Sapyga aculeata Cr.

Camponotus vicinus Mayr.

" sp.

Perilampus platygaster Say.

Habrocytus rosæ Ashm.

Passalœcus mandibularis Cr.

Lysitermus coloradensis Ashm.

Aspilota obscuripes Ashm.

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Aphidius montanus Ashm.
" *atropetiolatus* Ashm.
Sphecodes dichroa Smith.
Prosapis affinis Smith.
Formica integra Nyl.
Dolichopselphus n. g., n. sp., Ashm.

(3) Near Micawber Mine—
Pteromalus vanessæ Harris. Bred from a pupa of *Vanessa*. The larva of *P. vanessa* is about 2½ mill. long, and is tinged with purplish. The pupa is pale yellow, with the eyes red and very conspicuous.

(4) Timber line and above, above Smith's Park Gulch, Aug. 5—
Bombus ternarius Say.
Habrocytus rosæ Ashm.
Nomia nortoni Cr.
Atractodes sp.

Mr. Ashmead remarks, concerning *H. rosæ*: "I first received this species from Messrs. James Fletcher and Harrington, who reared it from a rose-gall collected in British Columbia." I have reared it from galls of *Rhodites ignota* O. S., and *R. fusiformans* Ckll., n. sp., collected at West Cliff.

(5) Near Micawber Mine, Aug. 4—
Tapinoma sessile Say.
Lipolexis atriventris Ashm.
Habrocytus rosæ Ashm.
Leptacis tetraplasta Ashm.
Psilophrys occidentalis Ashm.

(6) Smith's Park Gulch, Aug. 5—
Calliopsis sp.
Tenthredo occidentalis Cr.
" *ferrugineipes* Cr.
Cremastus sp.
Tapinoma sessile Say.
Bracon sulcifrons Ashm.
Aphidius atropetiolatus Ashm

(7) Micawber Mine, Aug. 7—
Lampronota coloradensis Cr.

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Camponotus sp.
Formica sp.
Cremastus sp.
Passalœcus mandibularis Cr.
Figites coloradensis Ashm. ♀.
Apanteles sp.
Aspilota pallidipes Ashm.
Pimpla annulipes Brullé.

(8) Horeshoe Bend, 1887—
Urocerus flavicornis Fl.

Dolichoselphus Ashm., is allied to *Atractodes*, with abnormally lengthened maxillary and labial palpi.

LEPIDOPTERA.

Mr. W. H. Edwards has kindly examined many of the butterflies. The two species of *Cidaria* were identified by the Rev. G. D. Hulst.

(1) Lakes of the Clouds, 1887—
Colias meadii Edw.

(2) Near Micawber Mine, 1888—
Nathalis iole Bdv.

(3) Near Brush Creek, June 27, 1889—
Phyciodes camillus Edw.
Nisoniades icelus Lintn.?
Argynnis hesperis Edw.
Lycœna sæpiolus Bdv., ♂, ♀.
" *oro* Scudd.

(4) Near Micawber Mine, June 27—
Pyrameis cardui L.
" " form *minor* Ckll., nov.
Anthocharis ausonides Bdv.
Vanessa milbertii var. *subpallida* Ckll.
Pieris oleracea Bdv.
Gnophaela vermiculata Grote.
Agrotis auxiliaris Grote.
Papilio rutulus Bdv.
Colias scudderii Reak.
Lycœna acmon D. and H.

P. cardui f. minor differs from the type only in being much smaller.

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A *P. rutulus* was caught at the flowers of *Erysimum asperum* var. *alpestre* v. nov.

(5) Timber line above Smith's Park Gulch, June 27—
Limenitis weidemeyerii Edw.
Chionobas chryxus West. and Hew.
Colias eurytheme Bdv.

C. chryxus was abundant, but difficult to capture because it flew over exceedingly precipitous and rocky ground.

(6) Horseshoe Bend Gulch, June 27—
Argynnis Edwardsii Reak.
Grapta sp.
Vanessa antiopa L.

(7) Timber line above Smith's Park Gulch, Aug.—
Brenthis sp.
Parnassius smintheus Dbl. and Hew.

(8) Smith's Park Gulch, August—
Brenthis sp.
Colias alexandra Edw. ♂.
Chrysophanus helloides Bdv.
Gnophaela vermiculata Grote ♂, ♀.
Limenitis weidemeyerii Edw.

(9) Near Micawber Mine, Aug.—
Gnophaela vermiculata Grote.
Cidara montanata Moesch. (Aug. 15).
" *nubilata* Pack. (Aug. 4).
Pyrameis cardui L.
Vanessa antiopa L.
Parnassius smintheus D. and H.
Limenitis weidemeyerii Edw.
Alucita hexadactyla L.
Grapta sp.
Pieris protodice B. and L., ♂ (Aug. 6).
Chrysophanus helloides Bdv. (abundant).
Nomophila sp.
Botys sp.
Metrocampa margaritata var. *perlata* Guèn. (Aug. 6).
Plusia sp.
Clisiocampa sp.

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Colias alexandra Edw., ♂, ♀
Pieris occidentalis Reak. (Aug. 6).
Satyrus charon Edw.
Colias eurytheme var. *pallida* Ckll.
" " var. *keewaydin* Edw. (Aug. 6).
" " var. *eriphyle* Edw. (Aug. 6).

(10) Horshoe Bend Gulch, Aug. 15—
Colias eurytheme Bdv.

ORTHOPTERA.

Ceuthophilus sp., near Micawber Mine.

HEMIPTERA.

The Hemiptera have been identified by Mr. Ashmead.

(1) Smith's Park Gulch, 1889—
Cicada sp.

(2) Timber line above Smith's Park Gulch, Aug. 5—
Nysius californicus Stal.

(3) Smith's Park Gulch, Aug. 5—
Lygus diffusus Uhler.
" *pratensis* L, var.

(4) Near Micawber Mine, Aug. 6—
Podisus bracteatus Fitch.
Nysius angustatus Uhler.
Anthocoris melanocerus Reuter.
Corizus hyalinus Say.
Hadronema militaris Uhler.
" *robusta* Uhler.

(5) Timber line above Smith's Park Gulch, July 27—
Lioderma viridicata Uhler?

(6) Micawber Mine, Aug. 7—
Lygus pratensis L., var.
Idiocerus alternatus Fitch.
Pycnoderes insignis Reuter.

(7) Near Micawber Mine, Aug. 15—
Alydus eurinus Say.

(8) Near Brush Creek, June 27—
Dacota hesperia Uhler.
Lygus pratensis L., var.

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DIPTERA.

Tipula sp., Micawber Mine, Aug. 7.

Musca domestica L., near Micawber Mine, Aug. 6.

Culex sp., Lakes of the Clouds, 1887.

Various other species of Diptera, etc., as well as some *Trichoptera*, and species of *Thrips* and *Tomocerus* (probably *plumbeus* L.), and many Aphides, are as yet undetermined. The Arachnida are represented by *Epeira* and *Misumena* (probably *vatia*), and *Phalangodes robusta* Pack. was found near the Micawber Mine, this being the highest altitude known for this species. The Myriapoda are represented by species of *Lithobius Geophilus* and *Julus*, and most interesting of all, *Polydesmus* was found near the Micawber Mine.

BIBLIOGRAPHY.—The only species hitherto recorded from 10,000 feet, or above, on the Sangre de Cristo Range, seem to be *Parnassius*, *Gnophaela*, *Brenthis* and *Bombus*. But some not very distinct ranges have been explored. Many species are recorded from Veta Pass, and Mr. Scudder has written (Appalachia, 1878) on the insects of Sierra Blanca, and Mr. W. S. Foster has collected Lepidoptera on Marshall Pass.

CORRESPONDENCE.

RARE CAPTURES.

Dear Sir:—When in London last winter, I assisted in naming the private collection of Mr. Rowland Hill, our present young curator. As I was going over his material, my attention was arrested by the unfamiliar look of a few specimens he had secured the season before; they had a resemblance to a familiar enough form—Lachnosterna—but much smaller, and I concluded that I had seen it before. After several ineffectual efforts to secure its name, I sent a specimen to Dr. Hamilton, Allegheny, and he has identified it as *Cyclocephala immaculata* Burm., and remarks that "this species is widely distributed from Ohio to West Mexico, but I never heard of its being taken in the Northern States, east of Northwestern Ohio." I have also been in communication with Prof. Fernald, and I copy the following from his reply:—"No. 2 is *Pædisca nisella* Cl., a European species never before reported in the United States."

J. ALSTON MOFFAT, Hamilton, Ont.

Mailed March 1st.

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The Canadian Entomologist.

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ON CERTAIN STATEMENTS IN SCUDDER'S "BUTTERFLIES OF NEW ENGLAND."

BY W. H. EDWARDS, COALBURGH, WEST VA.

As Mr. Scudder has charged me with blunders of one sort or other, I am compelled to notice the matter, as silence on my part would properly be construed as an acknowledgement that he was right.

I. On p. 1805, the synonymy of Argynnis (Brenthis) *Freija* is given, closing thus: "Argynnis *Chariclea* Edw., in his catalogues." And on p. 1808, under *Chariclea*: "Argynnis *Freya* Edw., in his cat."

In the text, p. 1807, we read that "*Freija* is a circumpolar species in the strictest sense, being found on the northern shores of both worlds, and in each extending southward to the habitable zone. * * * In the New World it occurs from Alaska to Labrador, * * * and in the Rocky Mountain region as far south as Lake La Hache and Crow's Nest Pass, west of Fort McLeod. It is said by Edwards to occur in Colorado, but the specimens obtained there by Mr. Mead, to which he probably refers, belong to the next species" *(i. e.* to *Chariclea)*, "while three from Nepigon, referred by him to *Chariclea*, belong here" *(i. e.* to *Freya)*.

On page 1809, under *Chariclea*, we read: "This northern butterfly inhabits circumpolar lands on either side of the Atlantic, but extends much further southward on the western than on the eastern continent, being found * * * not only in Greenland and Labrador, but * * * even (in) Colorado," etc.

Now, although I knew I had not mistaken one of these species for the other, as alleged, I got from Mr. Bruce a pair of the Colorado form, taken by him last summer, and mailed them to Mr. Butler, British Museum, asking which species they were. The reply came two weeks ago, short, sharp and decisive: "Your species is *Freya*; it can by no means be confounded with *Chariclea* * * * It has nothing to do with *Chariclea*."

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The Colorado species is *Freya*. The examples taken by Mr. Mead in Colorado, 1871, and of which Mr. Scudder speaks, all passed through my hands, as did the whole catch. I received the butterflies, week by week, through the mails in papers; and, on Mr. Mead's return, we divided the entire lot equally between us. There were many *Freya* (and some of them I have now), but no *Chariclea;* nor has *Chariclea* ever been taken within the limits of the United States, so far as I know. It flies as far to the south as the Canadian Pacific Railway in the Rockies; and I not only have examples taken at Laggan by Mr. Bean, but I have twice had eggs and larvæ from him.*

II. On p. 1863, in the synonymy of Pamphila (Limochores) *Palatka* it is said that Pamphila *Dion* Edw., CAN. ENT., XI., 238, is the same thing.

*Mr. Scudder says, page 1807, under *Freya*, by which he means *Chariclea*: "To judge from the captures north of Lake Superior, it is a late species, flying late in August and early in September, or at the very close of the season, at that place. Evidently winter must be passed, by the caterpillar just from the egg." I have not learned from Mr. Bean the date of first appearance of *Chariclea* imago, but I received eggs sent by him 4th of August, 1866, and another lot 6th August, same year. Part of each lot hibernated direct from the egg, but part went past third moult and then hibernated. I lost these during the winter. But these last larvæ, had they lived, would have reached imago three or four weeks earlier than the larvæ that hibernated from the egg. This would give the appearance of two broods of the butterfly, and account for some flying in July and others in September.

Under *Chariclea*, p. 1809, by which Mr. Scudder means *Freya*, we read: "Nothing is known of its seasons or history, except that it appears in Colorado early in the season, in May, or early in June, so that winter can certainly not be passed as a caterpillar just from the egg." I have not had eggs of *Freya* from Colorado, but received some from Laggan, sent 6th June, 1886; and again, sent 4th June, 1889. I lost the survivors of the first lot after they had passed the second moult; but those of the last lot (6) reached eight-tenths of an inch in length, and had passed three moults before 2nd July. I thought from their actions they would pupate, but after several alternations of quiet and activity, they finally dropped asleep, and I sent them to Clifton Springs, N. Y., 16th of July, to go in the refrigerating house.

The species *A. Helena* is the representative of *Chariclea* in Colorado, and as that behaves so *Chariclea* might be supposed to behave, if it dwelt in Colorado. Eggs of *Helena*, sent from that State 24th July, 1886, gave larvæ, all of which passed the third moult and then went into hibernation. I lost them during the winter.

I may as well here speak of one other of this group, *A. Triclaris*, found in Colorado and north. I received eggs sent from Laggan, 2nd August, 1889. The larvæ passed second moult and hibernated, and were sent to Clifton Springs 19th September.

The larvæ of all four species are closely like that of *Bellona*. In the first stage, the alternate segments are green and brown, as in *Bellona*, and also *Myrina*. The spines of *Triclaris* are somewhat different from the rest after the first stage, but these others are same as in *Bellona*, so far as I carried the larvæ. Mr. Scudder has tried hard to find characters in the preparatory stages by which to separate the genus Brenthis Scudder (not the coitus Brenthis of Hubner, by a good deal), but wholly without success; and the same is true of the imago. The small species are merely a group of the genus Argynnis. As to two other genera, so called, chipped off from Argynnis, viz., Semnopsyche and Speyeria, there is not a feature in any stage to justify either of them.

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Had Mr. Scudder read the two descriptions ever so carelessly he ought not to have made a mistake like this. Also Prof. French pointed out to him the error, and I did the same indirectly through Mr. French. But, nevertheless, he was bound to have his own way. The species *Palatka* was named from a single ♂, 1867, taken at St. Augustine, Fla. In several years this example was an unique. I have it before me now as I write. But in later years *Palatka* has been taken abundantly at Indian River, mostly by Dr. Wittfeld, and is known to all collectors. In the description the expanse is given at 1.7 inch. Omitting all mention of upper side, we come to under side of secondaries, which differs widely from *Dion* in colour and absence of markings, "Under side of secondaries uniform brown, immaculate." *P. Dion* was described in 1879, from the southern shore of Lake Michigan, from Hamilton, Ont., and from Nebraska. It is compared with *Arpa* B. & L. Expands 1.2 inch (that is to *Palatka* as 12 is to 17). "Under side of secondaries ferruginous, of uniform tint, *except that there are two pale rays from base*, one of which passes through cell, the other occupies submedian interspace to margin." These pale rays are a conspicuous feature of this species. *Palatka* is a coffee-brown, solid colour. *Dion* is a red-brown, with two pale bands. On p. 1931, among "Additions and Corrections," are these words: "1715, line 9, the species here referred to as *L. Palatka* is not the *Palatka* of Edwards, but his *Pallas*." I never described a species under the name of *Pallas*. The author has got things in a tangle.

III. On p. 1595, in the excursus "Butterflies as Botanists," we read: "The narrow choice of certain species is, perhaps, indicated in our own fauna of the food plant of Phyciodes *Tharos*. So far as we know it feeds only upon a single species of Aster; 'and if your butterfly selects only that,' said the late Dr. Gray, when I told him of this, 'it is a better botanist than most of us.' Only one other plant has been alleged as its food, and that probably by mistake. This special aster the female selected out of many furnished it by Mr. Mead whereon to lay her eggs, and no one has yet reared it upon anything but aster Novæ Angliæ. * * * Such restriction of choice, if really true, certainly indicates some keen perception on the part of the butterfly." It certainly would.

Mr. Mead, CAN. ENT., VII., 161, 1875, says: "I prepared a box by partly filling it with earth, and transplanting into this small specimens *of all the common Compositæ I could lay my hands upon*, * * * and

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about a dozen ♀ ♀, *P. Marcia* and *Tharos*, were introduced. In a few days I examined the leaves and found six patches of eggs upon one of the plants, etc. The plant proved to be a species of aster, * * * from the leaves I think it will prove to be aster Novæ-Angliæ. No eggs were found on any of the other plants." He also says that he afterwards found a brood of young caterpillars upon a plant of this aster in a meadow.

In CAN. ENT. IX. 1, 1877, I related that I was in the Catskills with Mr. Mead when he made the above mentioned discovery, and that I afterwards got eggs for myself by tying the female butterfly over the stems of A. Novæ-Angliæ, and brought the larvæ while young to Coalburgh. "On the journey, stopping at several points, I had to give them leaves of such species of aster as I could find, and they ate any and all readily—even German Asters from the garden." Then I related how I repeatedly got eggs of *Tharos* in same way at Coalburgh, W. Va., (where A. N.-Angliæ does not grow). I do not know that *Tharos* will feed on any other plants than asters, but they will eat any sort of aster surely.

IV. On p. 1926: "Mr. Edwards tells me that Mrs. Peart observed one case (of *G. Interrogationis)* in which the final egg of a chain had eleven ribs, when all the others had nine. Could a second female have *possibly* placed an egg upon a chain laid by another!?" I did not know what the author meant to imply by the italicised word and the note of surprise. The observation as to this chain of eggs is mentioned in Part VIII., Vol. 3, Butt. N. A., in the paper on *Interrogationis*, as follows: "I had supposed the number of ribs in all eggs laid by one female was the same, but Mrs. Peart found that, in a string I sent her, the topmost egg had eleven ribs, while all the rest had but nine, as shown on the plate, fig. a^4." The eggs were laid by a single female in confinement, and were put in alcohol and so sent Mrs. Peart. It occurred to me to ask Dr. C. S. Minot, an authority in biology, if he could explain how this could have been, and he replied: "The eggs of insects descend from the ovarian tubes into the so-called uterus, where they lie for some time, and have the shell formed by the secretions of the uterine walls. These walls are thrown into folds, which are characteristic of the genera and species, and the egg shell, so far as its outer pattern is concerned, is a cast, so to speak, of the folds in question. It seems to be quite possible that the number of folds (and therefore the number of ribs on the shell) should vary in different

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parts of the uterus. But I doubt if there are any observations on that point at present." That seems a reasonable explanation.

V. *Argynnis Atlantis*, p. 578. It is said: "The early history of this species is almost wholly unknown, the different stages of the caterpillar and the chrysalis never having been adequately described." I had this species from the egg, and described every stage, egg, larva and chrysalis, in CAN. ENT., XX., p. 1., 1888, in the manner usual with me; and as Mr. Scudder has copied my descriptions of other species by wholesale, I am at a loss to see what there is "inadequate" in this of *Atlantis*, or why it is dismissed so curtly.

VI. *Colias Eurytheme*, p. 1126. Under the division of *Eurytheme-Eriphyle* comes the species *Harfordii* H. Edw., and its var. or co-form *Barbara*, and reference is made to the description and life history of same, with plate, in Butt. N. A., V., 3. I showed in the paper cited that the male *Harfordii* comes near *C. Interior* Scudder, a species which the discoverer regards as genuine; and that the var. (or co-form) *Barbara* approaches the *Eurytheme* group, *i. e. Eurytheme* and *Philodice*, and I said, "So that the species in certain points resembles species belonging to two distinct sub-groups." Dr. Hagen, Trans. Bost. Soc. N. H., 22, 165, 1883, judged *Harfordii* to be neither more nor less than *Interior*. Mr. Scudder might have compared the genitalia, as he believes in those organs as tests of species, and told us wherein *Harfordii* resembles *Eurytheme*.

VII. *Limenitis Disippus*, called Basilarchia *Archippus*. There is so much in this life history that is at variance with what I myself have observed in West Virginia, that one would seem to be dealing with a distinct species, and that the New England form could not be the same as the Virginian.

Page 261. The protection of the egg from "ants, mites and spiders * * * is undoubtedly in the fewness of their number on one plant. The spider that finds two eggs of a Basilarchia in one day must be an excellent hunter." In this region there is no limit to the number of eggs that may be laid on one tree. The seedling plants of aspen are often full of eggs or larvæ. On one occasion I found four larvæ on four leaves of one little stem; on another I found eleven eggs and young larvæ on a plant not over eighteen inches high, nearly one to every leaf; on another I found nine eggs on a small tree. I once discovered a female oviposit-

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ing on a willow of some ten feet high. She laid in my sight at least six on different parts of the tree, and I brought away two of them, the rest I was unable to reach.

I asked Prof. Rowley, at Curryville, Mo., what was his experience in this matter, he says: "I watched a female *Disippus* last August laying eggs on aspen. She flitted here and there, and in the course of about fifteen minutes had laid a dozen eggs, and was busy when I inadvertently frightened her away. Once or twice she returned to the same twig. In searching for cases of this species on New Year's day (1889), I examined but two plants of willow; the first, scarcely four feet high, yielded twelve cases; the other, less than ten feet high, gave me forty-five. In one case, two were found on one twig, not twelve inches apart, on another three. I have seen five larvæ on one small sprout of aspen; seven eggs on another. Once found two young larvæ on one leaf, both on perches, one at the end, the other at the side."

Page 273. "On hatching * * * it eats the apical leaves, and then those next in order, omitting none in its passage down the stem, so that, as Lintner says, its position may be 'at once revealed by the twig upon which it had fed * * * being entirely defoliated from its tip about eighteen inches downward, leaving only the footstalks remaining.'" The fact is that the larva makes its case of the leaf it was hatched on, though, for cause, it will move to another in order to make the case. As to stripping a stem, even the mature larva does not do that to any such extent as is intimated above that the young larva does. It is at all stages a light feeder.

Page 277. "It is a curious thing that we find in the caterpillars of the first brood, no tendency whatever to construct hibernacula; here we have an instinct inherited by alternate generations." On page 1416, speaking of the same caterpillar: (it is) "the caterpillar of the latest brood which constructs a hibernaculum * * *; yet, with this common butterfly, no instance has been given where a caterpillar of an earlier brood showed the remotest tendency towards such action." Now, Mr. Scudder may be right for New England, where *Disippus* is said to be two-brooded only, but in West Virginia the caterpillars of the brood before the last (there being three annual broods) often make hibernacula, and some of the same lot will do this, while others go on to pupa and imago. If this fact has never been recorded before, I put it on record now. Some

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of a lot of larvæ also will make their cases after second moult, others after third and in the following spring. Some, but not all, of those which hibernated after second moult, will pass three more moults. There would seem no reason why some larvæ of the first of the three Virginia broods should not make cases, as some of the second (in mid-summer) do. And certainly we could not say positively that they do not; nor do I see how one could say positively that some of the first New England brood do not make cases. The evidence against it is negative only. I have found that caterpillars and butterflies are apt to do just what we would think they could not. I never knew of a larva hibernating after first moult, as it is stated that they "not at all infrequently" do, on page 275; nor do I think the small larvæ, after that moult, would have the physical ability to cut out and weave together a case.

A RAINY DAY ON THE MOUNTAINS.

BY DAVID BRUCE, BROCKPORT, N. Y.

There is a tradition extant in Denver that the sun shines in Colorado nearly every day. This last summer was a woeful exception, however, for, from the middle of April until the end of June, the weather would have been thought respectable only in Labrador, but the unusual wet and cold spring, although it retarded the insects, gave such an impetus to the growth of flowers and herbage on the mountain sides and tops, that, when the hot weather set in, all species of diurnals appeared to be unusually abundant, and every kind seemed to be flying at one time. I had collected for some time with indifferent success during this wet season in the foothills and lower canons, and I made up my mind, despite the weather, to try the higher ranges. So I climbed above timber line one showery afternoon the beginning of June, and spent the night in the same shanty I had occupied on my visit in 1887; the proprietors, two honest miners, welcomed me heartily. The next morning was gloomy, cold mists rolled up from the valley and white clouds collected round the peaks, but I donned a pair of miner's overalls and went out determined to do something. In a drizzle that seemed as much snow as rain, I climbed the sloping sides of Mount Bullion, which was covered more thickly with

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vegetation than I had ever seen it before, owing to the frequent rain. I had not searched long before I found several full grown larvæ of *Parnassiuss Smintheus* on Sedum. This was a fair beginning, as I had for several years searched unsuccessfully for this larva. A pretty Arctian larva was also feeding on the same plant (from this I bred *Arctia cervinoides* Strecker). I commenced overturning the smaller rocks, and was soon rewarded by finding numerous larvæ and pupæ, also many small Noctuids. Attached to the sides of larger rocks I found several pupæ of butterflies; these produced in a few days *Melitæa anicia* and *Argynnis Helena*. Under flat stones and in crevices were many species of *Agrotis*, sometimes from ten to thirty individuals crowded together. The ants were swarming under most of the rocks, and they, with the predaceous beetles had destroyed hundreds, as was evidenced by the mutilated wings and empty pupæ. I was so fascinated with my occupation that I forgot all about the weather. After I had filled all my tins and boxes and got very hungry, I worked my way to the cabin again, quiet satisfied and surprised with the morning's work. From the larvæ and pupæ obtained I bred:—

Arctia cervinoides Strecker, five specimens.

Arctia Brucei H. Edw., three specimens.

Arctia sp. (?), one specimen.

A grey *Bombyx*, allied to *Dasychira*, from a tufted pupa enclosed in a cocoon like *Halesidota* but thinner, this came out next day in the box, and I didn't see it until it was spoilt and could not recognize it.

Apatela, two, allied to *Felina*, but larger and darker.

Plusia Hochenworthi, several.

Agrotiphila Montana, six, the pupa and imago were common under rocks.

Agrotis ochrogaster, four, imagines abundant and variable.

Agrotis, several specimens not yet determined.

Hadena lateritia, one.

Anarta melanopa, common, both pupæ and moths.

On sheltered sides of rocks were several *Glaucopteryx magnoliata*, or a species very like it, and one *G. phocataria*. Larvæ and pupæ of *Melitæa anicia* were not uncommon. *Argynnis Helena*, one pupa, also one of *Pieris calyce*.

The elevation of my hunting ground was about 13,000 feet.

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THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA COMPARED.

(Sixth Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Stiriini.*

This tribe is, so far as I know, exclusively American. The thorax is elevated, the patagia usually deflected. The eyes are naked; the front embossed; the legs thinly scaled, with a claw on front tibiæ; the abdomen somewhat short and weak, untufted on dorsum; the wings pointed at tips. The genera seem to fall in between *Calpe* and *Plusia.** They are: *Basilodes, Stiria, Stibadium, Fala, Plagiomimicus, Acopa.* The genus *Cirrhophanus* probably belongs to the *Heliothini;* we do not know the larva, but the moth is allied to *Chariclea delphinii,* by the Hübnerian character of the pattern of ornamentation. It is probable, also, that *Chamaeclea* is best placed among the Heliothians.

Polenta, referred here by me (CAN. ENT., XV., 75), based upon an erroneous identification of Mr. Morrison's *Tepperi,* with my *Plag. Richi,* may be related to one of the species figured by Hübner in the "Zutraege," under *Schinia.* I saw the type, but was not able to examine it for generic characters. It seemed to me to be a faded example of a southern form of *Plagiomimicus,* which I possessed, narrower than *Pityochromus,* of a delicate olive green, with a frontal cup-like excavation and a claw on the fore tibiæ. Mr. Smith assures us that *Tepperi* has the fore tibiæ unarmed; consequently, I described my species as *P. Richi.* Finally, Mr. Smith's *Cerathosia* may belong here. This moth has the false appearance of a *Psecadia.* I have shown that it is not a micro, neither is it an Arctian, "next to *Utetheisa,*" as stated by Mr. Smith. It has a globose thorax; a frontal horn, thinly scaled legs with a claw on front tibiæ. The shape

*In reference to the question of rank in the Lepidoptera and to a former paper of mine in these pages, I would state that, while from morphological grounds, we must consider the four-footed butterflies as the highest, the sequence *within* the family must be decided on comparative grounds. It may be that the *Satyrinæ* are the lowest subfamily group of the *Nymphalidæ,* but they must be nevertheless classed with the family. The characters by which the butterflies approach the moths are apparent in all the groups, as might be expected if we consider the moths to represent an older phase of the Lepidoptera. The highest *Nymphalidæ* must be sought for in the tropics; but it may be, that the sequence in our North American fauna is to be inaugurated by the Hackberry butterflies.

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of the wings is not unlike *Acopa*. The secondaries are 8-veined: vein 5 weaker; costal vein 3-branched; 7 to tip; 7 and 6 a rather short furcation; 8 thrown off from the upper margin of 7 near the base. The frontal horn is impressed on the face. The moth was evidently classed "next to *Utetheisa*," upon Hübnerian characters: the paler, spotted and narrower primaries the bright discolorous hind wings. A superficial resemblance to *Emydia* and *Utetheisa* is thus given. *Utetheisa* has a smooth front and unarmed tibiæ, fringed antennæ, with two stronger bristles on each joint. *Cerathosia* has ocelli, and is otherwise distinct from the Lithosians, while the curious termination of the generic title *(thosia?)* would seem to be a fragment of the Greek *lithos*. The discovery of the larvæ of *Cerathosia* will probably throw additional light upon the affinities of the insect. In the mean time, I wish to point out that, in its generic characters, this form coincides in many particulars with the Noctuidæ belonging to this tribe, as also to the *Tarachini* in its scaly vestiture.

Tribe *Plusiini*.

The thorax is rather short and square, but globose above, with hairy, somewhat silky covering, which forms, posteriorly, an abrupt tuft. The eyes are naked, lashed in *Plusia*, unlashed in *Telesilla*. The wings are somewhat pointed with full external margins. The tibiæ are unarmed. The ornamentation of *Plusia* is remarkable for the silvery or golden middle marks, or sheeny patches. The American species are forty-two in number, exceeding the European thirty-eight; but, probably more remain to be described with us. We have representatives species, i. e. *Putnami*, allied to the European *festucæ*, while *parilis* is found in Lapland and Labrador. The question whether *ni* can be separated from our *brassicæ*, I have been inclined to answer negatively. The peculiar abdominal tufts speak for the identity of the forms. Among American forms are a greater number of gray and brown species, allied to *gutta*, *interrogationis*, *chalcytes*, etc., and are, perhaps on the whole, less showy. Nevertheless, a resemblance may be traced between many species, as between *V-argenteum* and *Mappa*, *Zosimi* and *balluca*, etc. The resemblance is further shown in the species of *Habrostola*, which have the caterpillar 16-footed and the moths without metallic marks, while *Plusia* has 12-footed larvæ. But the most remarkable among the American species of *Plusia* are the three mimetic forms: *thyatiroides* which resembles a

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Thyatira, formosa which resembles a *Leptina* and *striatella* which resembles a *Heliophila (Leucania). Behrensia* is a Californian type, allied to *Habrostola;* and *Deva*, an eastern and western genus, as closely allied to *Plusia.*

Tribe *Heliothini.*

The body is untufted, the abdomen rather short, the eyes (except in *Anarta)* naked, sometimes narrowed, the tibiæ usually armed, the antennæ brush-like. The activity of the species, and several of their characters, suggest a resemblance to the *Agrotini;* so that I have thought of them as flower-haunting Agrotidians, whose bright colors are due to their changed habits and the gay tints of their floral homes. How the colors of the larva may come to resemble those of the plant on which it feeds, how the tints of the moth may copy the corolla in which it hides, has been shown by Prof. Kellicott in the case of *Rhodophora florida.* Several of the European genera are represented in North America by identical or related species. In particular is this the case with the species of Hübner's genus *Heliothis.* As might be expected, the flowery western plains afford a large number of species; while, in Europe, there are some forty species belonging to about thirteen genera, in America we have over 110 species belonging to about thirty-five genera. The species of *Heliothis* seem identical with the European; whether they have been imported with plants (which seems less likely), or are unchanged survivals, I cannot decide. No variety of *armiger* like var. *umbrosus*, which is longer, more of a pale olivaceous, and not dirty ochrey like the type, and which I have taken in Southern cotton fields, seems to be known in Europe. My *Pyrrhia angulata* and *P. stilla* are, beyond any question, distinct from the European *P. umbra.* The pink and yellow *Rhodophora* and *Rhodosea* are peculiar to America; the extraordinary genus *Heliochilus* is said to occur likewise in Aisa. The shiny white genera *Euleucyptera* and *Tricopis* are peculiarly American. I regard *Nyctophaeata (Epinyctis)* as a Heliothian, notwithstanding certain coincidences, mostly in outline, with the *Cuculliini*, or again in armature with *Cleophana.* The European genus *Xanthodes* appears to belong here, and we seem to have a representative species in the Texan *X. buxea*, but I have not been able to compare the moths. The white coloured genera *Antaplaga, Grotella, Triocnemis*, prepare us for the following tribe. Our beautiful western species, *T. saporis*, has a resemblance to the European *Euterpia laudeti.*

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Tribe *Tarachini.*

The thorax is squamose, being covered with flattened scales. The legs and wings are also covered with oppressed scales; while the form is, on the whole, like the preceding type. Whether more than the genus *Tarache (Acontia)* and *Chamyris* belong here, I am doubtful—*Trichotarache* having a resemblance to the Heliothians, to which *Xanthodes* and *Trileuca* may also belong. The genus *Tarache* has its metropolis in Africa. We have some twenty-two species, while Europe has but six. The species bear a general resemblance to each other from the prevailing white colour, to which *terminimaculata* offers a singular exception. Our most beautiful species, with a resemblance to the exquisite moth *Ciris Wilsoni*, is, perhaps, *Tarache lactipennis* Harvey.

Tribe *Eustrotiini.*

The moths are small, with broad squarish primaries, which have usually somewhat of a tortriciform cut, rounded secondaries, the squamation on the body thin, mixed scales and hair. The eyes are naked, antennæ simple, the form is frail. Boisduval calls these insects "*Noctuophalenidæ.*" The caterpillars are 12 or 14-footed. The typical genus *Eustrotia (Erastria)* has nine European and thirteen American species. The European genus *Thalpochares*, with twenty-six European species, is but sparingly represented with us. I have been able only to study the neuration of *aetheria*, which is an undoubted *Thalpochares*. In this group I have found the neuration useful in separating the genera. From neurational characters I have separated the American forms, related to the European genus *Agrophila*, under *Spragueia*. I have also referred here, under the generic name *Euherrichia*, certain American forms with silvery marks, previously referred to *Eriopus*. The peculiar Californian genus *Annaphila*, with fourteen species curiously resembling miniature *Brephinæ*, I refer also here. Among interesting American genera are *Exyra*, which is parasitic on *Sarracenia*, the pitcher plants; *Escaria*, a western form, and *Azenia* with large clypeal projection. This tribe, although represented by some of the principal European genera, offers many peculiar American forms, such as *Tripudia*, *Gyros* and *Fruva*. The departure from the European types is perceivable. Consult for the neuration of *Thalpochares* and *Eustrotia* Grote, N. Am. Ent., I., p. 46–47. Also, for the structure of *Erotyla*, *Spragueia*, *Fruva*, *Xanthoptera* and *Exyra*, CAN. ENT., XI., pp. 231–238. For *Euherrichia*, New Check List, 1882, p. 64, (sub. *Herrichia).*

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 55, Volume xxii.)

A. stretchii Grt.

1875—Grt., CAN. ENT., VII., 197, *Arctia.*
1883—Neum., Papilio, III., 150, =*intermedia.*
1886—Grt., CAN. ENT., XVIII., 110, an var *intermedia?*
Habitat—Texas.

There is no doubt but that Mr. Neumoegen's reference of this species to *intermedia* is correct.

A. superba Stretch.

1873—Stretch, Zyg. and Bomb., 227, pl. 9, f. 12, *Arctia.*
1887—Smith, Ent. Amer., III., 111, *Arctia.*
Habitat—Vancouver.

A. virgo Linn.

1758—Linn, Syst. Nat., I., 501 (ed x.), *Bombyx.*
1764—Clck.*, Icones, pl. 45, f. 5, *Phalaena.*
1764—Linn, Mus. L. U., 311, *Bombyx.*
1767—Linn, Syst. Nat. (ed. xii.), 820, *Bombyx.*
1775—Fabr., Syst. Ent., 582, *Bombyx.*
1781—Fabr., Spec. Ins., II., 199, *Bombyx.*
1787—Fabr., Mant. Ins., II., 129, *Bombyx.*
1791—Oliv., Ent. Meth., V., 93, *Bombyx.*
1793—Fabr., Ent. Syst., II., 1, 472, *Bombyx.*
1793—Gmel., ed. Linn. Syst. Nat., 2419, *Bombyx.*
1797—Sm. and Abb., Ins. Ga., II., 123, pl. 62, *Phalaena.*
1816—Hübner, Verzeichniss, 180, *Euplagia.*
1823—Hübner, Samml. Ex. Schmett. II., pl. 402, *Euplagia.*
1837—Harris, Cat. Ins. Mass., 73, *Arctia.*
1841—Harris*, Rept. Ins., Mass, 244, *Arctia.*
1856—Wlk., C. B. Mus., Lep. Het., III., 608, *Arctia.*
1858—Duncan, Nat. Libr., XXXII., 175, pl. 19, f. 3, *Spilosoma.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morris Syn., 338, *Arctia.*
1862—Harris*, Ins. Inj. to Veg., ed. Flint, 345, *Arctia.*

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1863—Saund., Syn. Can. Arct., 6, *Arctia.*
1864—Grt., Proc. Ent. Soc., Phil., III., 325, pl. 4, f. 4, ♂, *Arctia.*
1873—Stretch*, Zyg. and Bomb., 74, 126, pl. 6, ff. 1, 2.
1876—Moeschl., Stett. Ent. Zeit., XXXVII., 296, *Arctia.*
1878—Graef., Bull. Bkln. Ent. Soc., I., 4, var. of.
1878—Schaupp*, Bull. Bkln. Ent. Soc., I., 59.
1881—Graef, Bull. Bkln. Ent. Soc., IV., 58, *Arctia.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, *Arctia.*
1887—Smith, Ent. Amer., III., 110, *Arctia.*
var. **parthenice* Kirby.
1837—Kirby, Fn. Bor. Amer., IV., 204, *Callimorpha.*
1862—Clem., App. to Morris Syn., 339, *pr. var.*
1863—Saund.*, Proc. Ent. Soc., Phil., II., 28, *Arctia.*
1863—Saund.*, Syn. Can. Arct., 5, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 116, *Arctia.*
1864—Grt., Proc. Ent. Soc., Phil., III., 325, =*virgo.*
1879—Beth., CAN. ENT., XI., 153, *Arctia.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI., 71, =*saundersiana.*
1883—Neum., Papilio, III., 149, =aberr. *virgo.*
1887—Grt., CAN. ENT., XIX, 31, =*virgo.*
1887—Smith, Ent. Amer., III., 110, =*saundersii.*
Habitat—Can. to Ga., west to Iowa, Mo., Ills., Mich.
An omnivorous feeder, according to records and statements.

A. virguncula Kirby.
1837—Kirby, Fn. Bor. Am., IV., 304, pl. 4, f. 6, *Callimorpha.*
1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morris Syn., 338, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, 218, pl. 9, f. 5, *Arctia.*
1879—Beth., CAN. ENT., XI, 153, *Arctia.*
1881—Coquillet*, Papilio, I., 7, *Arctia.*
1887—Smith, Ent. Amer., III., 109, *Arctia.*
nais ‡ Saund.
1863—Saund., Syn. Can. Arct., 9, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 117, pr. syn.
Habitat—Can.. Me., N. Y., N. J., Ills.
Recorded as feeding on *Polygonum aviculare.*

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A. williamsii Dodge.

1871—Dodge, CAN. ENT., III., 167, f. 34, *Arctia.*

1873—Stretch, Zyg. and Bomb., 74, *Arctia.*

Habitat—Colorado.

(To be continued.)

CORRECTION OF AN ERROR.

BY W. H. EDWARDS, COALBURGH, WEST VA.

Mr. H. J. Elwes has recently published a paper in Trans. Ent. Soc., London, 1889, p. 535, entitled "A Revision of the Genus Argynnis," and on page 574 writes as follows :—"I have also specimens of *Arge* Strecker, from Strecker and Mr. Holland, both from Spokane Falls and California, which are, undoubtedly, the same as *Erinna*, which was described in 1883 as a var. of *Eurynome* by Edwards, and in his catalogue of 1884 is put down as a variety of *Montivaga*. If, therefore, he is himself so uncertain of the true position of these forms, he cannot expect others to follow him blindly," etc. On reading this I looked at the catalogue referred to, and sure enough, on p. 30, *Erinna* is set down as a var. of *Montivaga*. How this happened I cannot say, but I suppose by an error of the printer, which was overlooked in correcting the proof. I see the same mistake occurred in the list which closed Vol. 2, Butt. N. A., also dated 1884; but as the list was copied from the catalogue, that is understood. *Erinna* was rightly described by me in 1883 as a var. of *Eurynome*, which, to my mind, it undoubtedly is. Part of my collection is now in possession of Dr. Holland, including *Eurynome* and its vars., and I wrote him to please look at the *Erinna* specimens and tell me what the labels say. I have his reply as follows :—"All the specimens bearing that name are classified in your collection under *Eurynome*, according to your original description. The labels read:

A. Eurynome.
var. *Erinna* Edw.
Type. Spokane Falls."

I therefore suggest that persons using my catalogue should note the correction, and transfer *Erinna* to *Eurynome* on page 29, following *Arge*. Str.

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APPENDIX TO THE NOTES ON INSECT FAUNA OF HIGH ALTITUDES.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COLORADO.

Alpine Orthoptera.

Mr. L. Bruner has kindly identified the following Orthoptera, found at 10,000 feet and upwards :—

Circotettix undulatus Thos., near Micawber Mine, Aug. 6.

Ceuthophilus maculatus Scudd., ♂, near Micawber Mine.

Pezotettix dodgei Thos., ♀ and pupa, timber line above Brush Creek, about 12,000 feet, Aug. 5.

Gomphocerus carpenterii Thos., ♀, same locality and date as *P. dodgei*.

Alpine Lepidoptera.

The Rev. G. D. Hulst has kindly identified the following Lepidoptera, from 10,000 feet and upwards in Custer Co., Colo., additional to my previous list :—

Acidalia Californiata Pack., near Micawber Mine, Aug. 6.

Cidaria designata Hübn., Micawber Mine.

Botis plumbosignalis Fernald., near Micawber Mine, Aug. 6.

Euceratia ? georgiella Hulst., near Micawber Mine, Aug. 6.

There are a few misprints in my paper, viz.:—P. 39, line 15 from top, for Welsh read Walsh; p. 39, line 16 from top, for pickly read prickly; p. 56, line 9 from top, for *vanessa* read *vanessæ;* p. 57, line 9 from top, for Horeshoe read Horseshoe; p. 57, line 10 from top, for Fl. read Fb.; p. 59, line 7 from top, for Horshoe read Horseshoe.

NOTES.

THE TACHINID PARASITE OF CIMBEX AMERICANA.—Mr. L. Bruner, in the report of the Entomologist, Nebraska State Board of Agriculture, for 1888, has an interesting article on that notable pest *Cimbex Americana* Leach, in which he states that although the insect is abundant in Nebraska, he has failed to find that it has any parasite. Last year, however, I obtained a larva of *C. Americana* on willow by Short Creek, Custer Co., Colorado, which produced the puparium of a Tachinid parasite. In "Insect Life," 1889, p. 164, we learn that Mr. Lugger has also found a Tachinid parasite of the *Cimbex* in Minnesota, presumably the same species as the Colorado one. It will be curious if it turns out that the parasite is confined to high latitudes and altitudes, while its host is more widely spread. T. D. A. COCKERELL, West Cliff, Custer Co., Colorado.

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BOOK NOTICES.

THE CAVE FAUNA OF NORTH AMERICA, with remarks on the Anatomy of the Brain and Origin of the Blind Species. By A. S. Packard, M. D. Vol. IV: First Memoir—National Academy of Sciences. 4 to., pp. 156.

The author of this admirable volume is everywhere known throughout the scientific world from his numerous works, especially on Entomology, and has obtained a deservedly high reputation in Europe as well as in America. This reputation will, we are confident, be, if possible, enhanced by the elaborate monograph before us. It contains many original observations of cave animals, some careful scientific investigations, and a very interesting chapter of philosophic considerations. It is also fully illustrated by a map of the Mammoth Cave in Kentucky, a number of wood cuts and a series of twenty-seven beautiful lithographs, nearly all of them drawn by the author himself. The work begins with a description of the Mammoth Cave and others in the neighbourhood, and gives lists of the various animals found within them; an account of the Wyandotte and other caves in Indiana, Clinton's Cave in Utah, and one in Colorado; a discussion of the geological age of the caves and their inhabitants, the mode of colonization and the source of their food-supply. The second chapter describes the vegetable life of the caves, which is naturally of the most meagre description. Then follows a systematic description and list of the invertebrate animals found in North American caves, among which spiders are the most numerous. Insects are represented by eight species of Thysanura, four of Orthoptera, two of Platyptera, ten of Coleoptera and nine of Diptera—a by no means extensive list, but one that includes some very curious and interesting forms. The beetles of the genus *Anophthalmus* are especially remarkable and attractive to the ordinary entomologist. Lists are also given of the European and North American cave animals, and of the blind, eyeless creatures which do not live in caves, and which, strange to say, almost equal in number their cavernous relatives. The next chapter gives a careful account of the anatomy of the brain and eyes (when partly developed) of certain blind Arthropods. The chief interest of the work culminates in the final chapter where the author discusses the origin of the cave species as bearing upon the theory of evolution. We have not space for any abstract of his views, which are well-deserving of study, but must refer the reader who desires fresh evidence on the subject of evolution to the work itself.

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We entirely agree with the author in his closing words: "In the case of too many naturalists the dogma or creed of natural selection has tied their hands, obscured their vision, and prevented their seeking by observation and experiment to discover, so far as human intelligence can do so, the tangible, genuine, efficient factors of organic evolution."

AMERICAN SPIDERS AND THEIR SPINNING WORK. A natural history of the Orbweaving Spiders of the United States, with special regard to their Industry and Habits. By Henry C. McCook, D. D. Vol. I. Published by the Author, Academy of Natural Sciences of Philadelphia, 1889. 4 to., pp. 372.

The author of this sumptuous volume is so well known from his valuable and interesting works on the natural history of various kinds of Ants, and his charming little book, "The Tenants of an old Farm," that any productions of his pen are looked forward to with lively anticipation and keen interest. We are quite sure that no one of the subscribers to this, his latest and greatest work, has been in the least degree disappointed by this first volume of the promised three. Though spiders are not insects, we have no doubt that every entomologist, and indeed every lover of natural history in any of its departments, will deeply enjoy the perusal of this volume. We cannot give a better idea of its contents than by mentioning the subjects treated of. They are, first, the general classification, structure and spinning organs of spiders; the construction and armature of Orbweavers' snares; the characteristic forms and varieties of snares; unbeaded orbs and spring snares; the engineering and mechanical skill and intelligence of spiders; their modes of procuring food and habits in feeding; their fangs and poison bags; their modes of nest making and its development in various tribes; and finally the "genesis of snares." All these different subjects are fully illustrated with more than three hundred and fifty wood cuts. The second volume is to treat of the mating and maternal instincts, the life of the young, the distribution of species, etc.; and the third will be devoted to descriptions of the orb weaving fauna of the United States, with coloured illustrations of a number of species. The whole will form one of the most complete works of the kind in the English language. Entomologists will need to have long purses if they wish to possess all the literature of the day, and to procure for themselves such costly and beautiful books as Scudder's and Edwards's Butterflies and McCook's Spiders. We trust that all who can possibly afford it will aid the authors in their self-sacrificing enterprises by subscribing for their books, but those who cannot do so should us

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their influence with their local Scientific Societies and Public Libraries and induce those in charge to purchase these valuable works for the general benefit. We are glad to say that the Public Library in Toronto and our Entomological Society have set a good example in this respect and rendered these works available for many of our readers.

ENTOMOLOGICAL NEWS and Proceedings of the Entomological Section of the Academy of Natural Sciences of Philadelphia. Vol. I., Nos. 1-3.; January March, 1890.

We gladly welcome another addition to the serial publications on North American Entomology. There is plenty of room for this new monthly Magazine, as it takes charge of a field which we and others have been unable to cultivate fully. It is intended to bring before students and workers the news and gossip of the day gleaned from all quarters of the globe ; the contents of current literature ; abstracts of the proceedings of Societies, etc. We hope that the new venture will have the fullest measure of success, and enjoy a career of long continued prosperity and usefulness.

REPORT ON INSECT AND FUNGUS PESTS. No. 1. By Henry Tryon, Assistant Curator of the Queensland Museum. Published by the Department of Agriculture, Brisbane, Australia, 1889. I Vol., 8 vo., pp. 238.

We have perused with great interest this first work that we have seen on the Economic Entomology of Australia. Some of the pests referred to are very familiar to us here, for instance, the Codling Moth and the Woolly Aphis of the apple tree, while others are species closely allied to those which are very destructive with us. The report takes up the different fruits, vegetables and field crops that are most commonly cultivated in the colony, and describes the insects which especially attack them ; as far as possible the life history of each pest is given and remedies are suggested. The work is very carefully and thoroughly done, and will, no doubt, be of great value to the fruit-growers and farmers in that part of the world. Its usefulness would of course be greatly enhanced by illustrations of the insects treated of, but evidently there were difficulties in the way of procuring these that could not at first be overcome. Future Reports will doubtless be made more popular in this way. The author deserves much credit for the valuable book he has produced. We trust that the Queensland Government will give him all the assistance and encouragement possible in the prosecution of his studies in practical entomology, and enable him to continue a work that is of the utmost economic importance.

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CORRESPONDENCE.

RARE CAPTURES.

Dear Sir: In my letter with this heading in the March number, p. 60, there is an omission of a word which quite alters my meaning. Line 6 of my letter should read, "I concluded that I had *not* seen it before." I took *Pædisca nisella*, referred to at the same time, last August, about twenty miles north of Hamilton, in the County of Halton. I found it sitting on the trunks of small birch and poplar trees.

J. ALSTON MOFFAT, Hamilton, Ont.

GRAPTA INTERROGATIONIS AT MONTREAL.

Dear Sir: I was somewhat surprised to see the capture of the above species at Montreal recorded as being an unusual and almost unknown occurrence (Feb. number, page 40). In Mr. Caulfield's list, CAN. ENT., VII., 87, *Interrogationis* is given, "Rare; May (hibernated); July to October," and I have always considered it one of those species which are neither rare nor abundant. The first specimen I have any record of was taken by me in Mr. Trenholme's garden, Rosemount Ave., Cote St. Antoine, on Sept. 7th, 1886. In the fall of 1887 it was abundant at Mr. Trenholme's, and a number of specimens (all *Fabricii)* were taken; between that time and the present I know of about 40 other specimens being captured in various parts of the town, and I succeeded in rearing three separate lots of larvæ to imago during last fall, all feeding on elm leaves. The form "*umbrosa*" seems to be much rarer here than *Fabricii*, but a few have been taken by Mr. P. M. Dawson and other collectors. I saw a single specimen of *Interrogationis* at St. Rose, P. Q., July 6th, 1889, but was unable to catch it.

ALBERT F. WINN, Montreal, P. Q.

ERRATA.—The following corrections should be made in Dr. Hamilton's paper on "Balaninus" in the January number:—Page 1, line 23, and elsewhere, for "*proboscoideus*" read "*proboscideus*." Page 5, line 33, for "nostrum" read "rostrum." Page 6, line 34, for "three first" read "first three."

Mailed April 7th.

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The Canadian Entomologist.

VOL. XXII. LONDON, MAY, 1890. No. 5.

NOTES ON "A REVISION OF THE GENUS ARGYNNIS," BY HENRY J. ELWES, F. L. S., F. Z. S., ETC.

BY W. H. EDWARDS, COALBURGH, WEST VA.

So much of the text of Mr. Elwes' paper as relates to North American species has recently been printed in Psyche (March), but the synonymic list, which is most important for a full comprehension of the state of mind of the author, was omitted. I applied to the editor of the CAN. ENT. to print this list, but it was found that it would occupy nearly one-half the space of a number, and it was not thought expedient to give it. In course of the present paper, however, enough of said list will be given to show the features of the whole. Mr. Elwes, in "revising," as he terms it, has cut the forty-two species enumerated in Group I., in my Catalogue of 1884, adding *Cipris* and *Semiramis*, described later, to fifteen; and in Group II., makes one of *Bellona* and *Epithore*. He says, page 560, (Psyche, 308): "The Argynnides of North America are, without exception, the most difficult butterflies to classify that I have studied. I have a collection which includes authentically named specimens of almost all the species and varieties, many of them direct from such well known collectors as Messrs. H. Edwards and Morrison, many from Messrs. Strecker and Geddes. I have also seen some of the best collections in the United States." * * * "It seems presumptive for a man to set aside much of what has been written by those who have seen, both living and dead, so many more specimens than I have seen, etc."

Undoubtedly it is a difficult group, and Messrs. H. Edwards and Scudder, with myself, have studied it long, but do not pretend to know completely some of the forms; and it seems odd that a stranger can skip from ocean to ocean and back again, stop here a day and there a week to ply his net, visiting a few collections, and those mostly second or third rate, getting his specimens "authentically named," in nearly all cases by

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persons who never saw several of the described species, or have their knowledge at second hand, and on the strength of this pronounce judicially on the American Argynnides! One of my correspondents, a lepidopterist, not a mere collector, on reading the paper in Psyche, wrote me thus: "It is an amazing piece of presumption for a visitor to America to collect and buy a lot of specimens, and on the strength of that to denounce and try to overthrow the work of yourself and Scudder, who have been studying the butterflies for more than a quarter of a century, and must know a thousand times more about them than he possibly can." And another correspondent, of same character, says: "I think it a pity for a man to write on such a subject, unless he can throw some light on it."

Mr. Elwes gives the impression that he had studied the important collections of the country, but he never saw mine, nor that of Mr. Bruce (rich in the Colorado species), nor that of the American Entomological Society in Philadelphia, nor any collection on the Atlantic slope except Dr. Holland's, Mr. Neumoegen's, Mr. H. Edwards's and Mr. Strecker's. On the Pacific, those that he could have seen were local and small. It is known that I have sold my collection to Dr. Holland, but at the time Mr. Elwes visited Pittsburgh, the greater part of the rarer and less known Argynnides, and particularly those that have so perplexed this gentleman, had not been delivered. At Mr. Neumoegen's he scarcely glanced at the group, but gave all his time to the East Indian butterflies. He says himself that he "went through" Mr. Edwards' collection, but, as Mr. Edwards has not returned from Australia, I cannot learn at what pace, though I can imagine it. But he spent considerable time at Reading, and Mr. Strecker tells his friends that "he took copious notes," and that he "gave him many points." The paper shows as much.

I had cordially invited Mr. Elwes to visit me and inspect the Argynnides, but not finding himself able to come, he failed to see the most complete collection in the group treated of ever brought together, containing not only the types of all the species I had described, but every one of Dr. Boisduval's types of Californian species: in other words, of nearly every species described since 1852. Of the two species described by Mr. H. Edwards, and the four by Dr. Behr, I have examples named by them, and in most cases long suites, with all the varieties which during thirty years I had been able to bring together.

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I could have shown Mr. Elwes the points of difference in difficult subgroups, and could have named all his specimens "authentically." But he preferred to take counsel of this and that "collector," with the plain result that his specimens are not named "authentically," and that his collection must be a hopeless jumble. It is clear as can be from his list that in half the cases he does not know what he is talking of. For example: "*A. Aphrodite*, *A. Cybele*, *A. Alcestis*, *A. Cipris*, *A. Halcyone*. This is a group of species or forms which are extremely hard to define; and though Edwards and Scudder, and most other North American Entomologists, agree in keeping them separate, I think it is very difficult, if not impossible, to identify them, unless you know their habitat." (One would think that such cases were unheard of elsewhere. Habitat is an important aid in determining between closely allied species, and zoologists in every branch, and botanists, take it into consideration.) I have a pretty good series of all, except *Cipris*, which must be very close to, if not identical with *Alcestis*, etc." Plainly, he does not know *Cipris* then, a species closer to *Aphrodite* than to *Alcestis*. "Either such experienced collectors as Morrison or Geddes did not know *Aphrodite* when they saw it out of its usual range, or *Scudder and Edwards are mistaken.*" Truly, it does look so. However, it is not remarkable that the collectors named did not distinguish *Cipris*, inasmuch as, in their day of collecting, it had not been separated. "Mr. Edwards perhaps would say that my *Halcyone*, which were sent by Mr. Strecker, and taken near Denver, are not true to name; but what can they be from that locality?" Here it seems that locality helps him to decide on a species. "What can they be?" I can answer this pathetic appeal: *Halcyone* is not "taken near Denver," but *Cipris* is, and Mr. Elwes was viewing a *Cipris* undoubtedly. Now *Halcyone* does not belong to the *Aphrodite* sub-group, as anyone can see by the figure of the female in Butt. N. A., vol. 3, part IX. It has the peculiar cut of wings of *Edwardsii*, and great egg-shaped silver spots. So, here are two species our author is at fault about.

And he is bothered with *Chitone*, "sent by H. Edwards from Nevada," which "does not agree with W. H. Edwards' description on the under side" (which is the important side), "and is nearer *Nevadensis.*" He never saw *Chitone*, a species not taken in Nevada, but in Southern Utah and in Weber Mountains, and totally different on both sides from *Nevadensis.*

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A *Lais* "seems to me very near *Atlantis*"; and in the list, p. 546, he says "*Lais (Atlantis* var.?)," not being able to determine whether it is a species or a var. He never, in text or list, refers to the plate of *Lais*, in Butt. N. A., vol. 3, which, as well as the description, testifies to a species that cannot be confounded with *Atlantis*.

"There occur, however, in Nevada, forms which are described as *Laura* and *Macaria*, of which I have authentic specimens from Mr. H. Edwards, and which, by their under sides, seem to be *Coronis*." Then, in same connection, speaking of *Chitone*, as before quoted, he goes on: "None of these names can, in my opinion, be retained, except as synonymns, though they are *all kept up* in Mr. Edwards' Catalogue as distinct species." On this I remark that Mr. Henry Edwards is one of the few experienced lepidopterists who are well acquainted with the American Argynnides. He collected for several seasons in California and Nevada, and knows more of the living butterflies than any other one man. In doubtful cases I rely on his judgment above all persons. His collection does not embrace, by a good deal, all the described species; but, so far as it goes, it is complete, and each species is represented in long suites. This collection was undoubtedly the most important one Mr. Elwes visited. "In going through Mr. Edwards' collection, I noted *Columbia* as similar to *Hesperis*;" and on the strength of that casual glance one May morning, down goes *Hesperis* as *Atlantis* pure and simple, and *Columbia* as well but with a query, the usual confession of ignorance of its position. It takes something more than "going through" a collection in this fashion to make one's self acquainted with forty species, and giving the right to pronounce on them. In the present case, also, some deference might be thought due to Mr. Edwards' standing and experience. But, I doubt very much whether Mr. Elwes saw *Macaria*. So far as I know, it is not Nevadan, but is confined to the Greenhorn Mountains and Kern River region in South California.

"Whether *Montivaga* and its var. *Egleis* are really distinct from *Eurynome* and its varieties, is hard to say," p. 574. Who said *Egleis* was a var. of *Montivaga*? I am confident the author of this paper never saw *Montivaga*, unless under another name. It is neither *Egleis* nor *Eurynome*, but the same as *Arge* Strecker, which last is not *Erinna* at all, as anyone can see by reading the two descriptions. Mr. Mead, who has a keen eye for resemblances or differences, (alas, that he has gone over to the

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botanists !) on his return from the summer's collecting in California and Nevada, 1878, went to Reading, and at once identified *Arge* as *Montivaga*, many examples of which he had taken at Tallac, Nevada. The description supports Mr. Mead's testimony. *Erinna* was unknown till five years after *Arge* was described, when the first examples were brought in from Washington Territory. Neither it nor *Eurynome* are Californian. In Butt. N. A., Vol. II., *Eurynome* is figured and its egg: in Vol. III., *Egleis* and its egg. Apart from the sufficient distinctness of the imagos, the different form of the eggs is decisive, though doubtless Mr. Elwes does not know it. There is no appreciable variation in the shape of the eggs of any species of Argynnis. Mr. Scudder relies implicitly upon this fact, even in the characterization of genera. If one is higher than broad, with a given number of ribs, all are; if one is broader than high, all are. The egg of *Eurynome* is squat, as broad as high, with twenty ribs; *Egleis* is tall, considerably higher than broad, with eighteen ribs. I may say here that nowhere in the paper do I find the least reference to the plates in Butt. N. A., except on page 574. When talking of *Bischoffii* and *Opis*, I read: "In Edwards' figures I can see no specific characters." In the list most of the plates are referred to, but in the text no one would suppose that any of these species had been figured, or that such figures as are given were of the least use in determining species. The author prefers to trust to his "authentically named" specimens.

On p. 536, he says he has not *Inornata* in his collection, and indirectly that he never saw it, but he "cannot recognize it as a species." Nothing further is said of it, but in the list it is put under *Callippe*, "? var. vel trans. ad *Edwardsii*, vel ad *Zerene*, *Inornata*." *Edwardsii* in no one character resembles *Zerene*, and is Coloradan, while *Inornata* is found only in California. The plate shows it to be one of the most distinct species of the fauna. The male is as red as *Adiante*. *Callippe* has no red about it, but is dark and melanic. So that here *Inornata* is put down as related to three wholly unrelated species, under one of them, and *on its way*, "trans." to the other two !

A. Hippolyta, which is kept up" (a favorite and charming phrase !) "by its author as a species, and seems to be something intermediate between *Hesperis* and some form of *Zerene*" (all roads lead to *Zerene !*) "Its locality would indicate that it may be nearer to them than to *Atlantis*." (Observe the admission that habitat is worthy of considera-

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tion!) But, in the list, p. 547, *Bremnerii* is put as a true species and *Hippolyta* as a synonymn of it—not even credited as a var.! It strikes me there is discrepancy between text and list. And *Rhodope*, also one of the most distinct species in the fauna, is put under *Bremnerii*, to which it has no relation, as "? var. *Rhodope*." The "authentically named" specimens have misled the author, and, as usual, the plate would have set him right.

"The species allied to *Monticola*, namely, *Zerene* and *Bremnerii*, have puzzled me quite as much as Edwards, Strecker and others. In *the damper climate* of Oregon * * * a darker form, *Bremnerii*, occurs, * * * and might be considered as the Pacific coast form of *Atlantis*, but in the specimens taken at Mt. Hood, the silver is absent, and these might well be considered a northern and darker form of *Zerene*." A characteristic sample of this author's hazy views of species! In the first place, I will say, that Edwards is not and has not been puzzled by the species in question. In the next place, that *Bremnerii* is not at all like *Atlantis*. In the third place, I had long suites of the Mt. Hood specimens from Morrison, receiving by pre-contract every variety and every species taken, and no *Bremnerii* was without silver. Nor in the many examples I have seen from Oregon and Vancouver, have I seen one that was not as fully silvered as *Cybele*. In the fourth place, Mr. Elwes has never seen a *Bremnerii* without silver. Doubtless, he is talking of *Zerene*. And in the last place, notwithstanding all his bewilderment and error of determination, he actually puts in the list *Monticola*, *Bremnerii* and *Zerene*, as three of his fifteen true species!

A. Behrensii is put under *Monticola* as "? var.," with this funny comment: "? trans. ad *Monticola*, vel. ad *Bremnerii*, nomen vix conservandum." Now, *Behrensii* resembles neither; it is one of the rarest of our species so far, and in all these years I have seen but four examples of it. I do not believe the author ever saw one. Here again the plates could have enlightened him.

So much for ignorance. There is another class of species, differing radically in colour, size, form, and in the shape and number of the silver spots, which, to our author's eye, look all alike. "*A. Leto* is a species which, though undoubtedly nearly allied to *Cybele*, is fully as distinct from it as *Nokomis*, and may be regarded as its Pacific Coast form in the

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same way as *Nokomis* is the form (i. e. of *Cybele)* of the dry central plateau of the continent." He had already said that *Cybele* and *Aphrodite*, and several others, were all one species, and now gets into the same corral *Leto*, *Nokomis* and *Nitocris*, which last, he says, is nothing but a form of *Nokomis*. And he quotes the wise remarks of his friend and counsellor, Strecker, with approval: "I have always contended that *Nokomis* was a pale abnormal form of *Cybele*, of which we have so many other instances in other species, (I should like to see a statement of these other instances !) from the *dry salt regions* of Utah and Arizona," p. 568. Pity that Mr. Darwin had not lighted on that explanation of the origin of species ! The dry salt air changes the form of a species, changes its coloration throughout, changes the form of the silver spots, enlarges or decreases their number, lines the spots with heavy bars of black on both anterior and posterior sides. Thus a *Nokomis* is manufactured out of a *Cybele ! Leto* is as unlike *Cybele* in shape, in the silver spots, their size and number, and in the colour of both sexes, as it is unlike *Zerene*. *Nokomis* female, on the upper side, is of the same pattern as female *Diana*, the spots being yellow, which in *Diana* are blue. *Leto* female, in place of the extra-discal oblong spots on hind wings, seen in the other two species, has a solid yellow band. To me it seems absurd to the last degree to be talking about the identity or even the nearness of the three species to each other. I happen to have bred *Leto* from egg to imago, and the larva has striking differences from that of *Cybele*. And how any one can look at the plates of *Nokomis* and *Nitocris*, and call them forms of one species, is past my understanding.

A. Semiramis "*to my eye* is nothing more than a form of *Coronis*, in which the black markings of the upper side have become paler and more reduced, *as might be expected* from the arid character of the country where it is found. It has been taken by Mr. Wright in the mountains separating the San Bernardino Valley from the Mohave Desert, and was not out when I visited these mountains in May, 1888." Why might it have been expected ? That strikes me as on a par with the reason given for transformation of species in Utah, the dry salt air ; and in Oregon, the damp climate. As it happens, the region where *Semiramis* is found is not on the desert side of the mountains, and Mr. Wright, in answer to my inquiry, denies the arid character, and says that no mountains are dry

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there. " The winds all the year are from the Pacific ; the desert is 20 miles away, across 5,500 feet of a mountain range."

"*A. Adiante* is a form which both Strecker and Edwards consider distinct. On the coast of Calif., according to Strecker's information, it is now extinct, and all the male specimens *(I have seen no females)* in Mr. Godman's and my collection were evidently taken many years ago. I should certainly be inclined to set it down as a variety of one of these species," *i. e. Zerene* or *Monticola*. " The opinions held twenty-five years ago, when Dr. Behr was an active collector, are not conclusive." In the list, under the true species *Zerene*, is set: " ? *Hydaspe* Bdvl.; ? *Irene* Bdvl.; ? *Rupestris* Behr.; ? *Adiante* Bdvl." Now *Hydaspe* is really a var. of *Zerene*. I have Boisduval's types of both. *Rupestris* is in no way related to *Zerene*, and in both these cases the author is unable to pronounce definitely. He does not know, confessedly, what they are ; nor whether *Adiante* is a var. or not. In the text, he says he thinks it is a var. of either *Zerene* or *Monticola*. Well, which ? Knowing nothing at all, he puts it as a ? var. of *Zerene*. Perhaps if one could cut down the wings of *Zerene* or *Monticola*, trim the edges a little, change the hue of the upper side, reduce to streaks all the heavy black markings or obliterate half of them, wipe out all the marks and spots of the under side, one could manufacture an *Adiante* that would seem the real article to the reviser of the Argynnides. For myself I am content with the species as nature made it. But this is the process by which 42 species are cut down to 15.

I could have shown Mr. Elwes recent specimens of *Adiante* of both sexes, and told him where to seek it. In 1889, a correspondent obtained eggs of it for me.

In the list, p. 545, we have under the head of true species *Aphrodite* Fabr.; "? var. *Alcestis : Cipris* " (put as a mere synonymn of *Alcestis)*, " ? *Aphrodite* Mead " (which is neither more nor less than what, thirteen years after Mead's mention, was separated as *Cipris.)* But the gem of the group is put thus : " var. vel bona sp. *Nausicaa* Edw." It is either a var. or a good species, the author does not know which, but all the same it stands under *Aphrodite*, and another species is disposed of. If the author knows nothing, why not say nothing !

List, p. 541, " *Bellona* Fab.; var. *Epithore* Bdvl.; the fore-wings less

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produced apically, the hind margin convex (in *Bellona* it is concave or sinuous), the base less obscured, beneath paler." If these characters are not enough on which to found a species, or separate two species, how much further must we look? But in addition there are other separating characters.

What are we to think of a transient visitor on the strength of his desultory experience "going through" such collections as he had access to, pencil in hand and carpet bag in the hall, and of his "authentically named" specimens from "experienced collectors," making a list after this fashion? Confessing at every step that he is lost, groping his way by query marks, uncertain whether to call a thing a var. or a good species; but, all the same, putting each incomprehensible form under something else. He laments his trouble, but can't approve of Edwards' way of getting over the difficulty (Elwes' difficulty) by creating other species, p. 566. Everywhere trans. ad *Zerene*, vel *Edwardsii*, vel *Monticola*, vel *Behrensii*, vel *Callippe*, vel *Meadii*, one species half the time trans. to at least two others. The result of this floundering is a paper and list on the lines of, and level with, Strecker's Catalogue! With a difference, however, in favor of Mr. Strecker: that no matter how ignorant he is, he never allows it, but is cock sure that *Cybele* and *Leto* and *Nokomis* are but the same thing; and Colias *Eriphyle*, *Philodice* and *Eurytheme;* and Satyrus *Nephele*, *Ariane*, *Boopis*, *Gabbii*, *Alope*, *Pegala*, *Wheeleri*, all one (vide Cat.). We do not find him dealing in query marks or alternatives. Such assurance is at least refreshing in contrast with the painful uncertainty and confusion of this paper.

Indefinite knowledge is definite ignorance, but when one is in the latter state, why take the world into his confidence?

I suppose, before Darwin, all naturalists were perforce lumpers of species. Each species was a little world with its group of satellites. But, since 1861, the view is changed, and in this country lumpers are nearly as scarce as dodos.

I myself am the reverse of a lumper in my method of work, and as I have always avowed the fact, my position is well understood. "I apprehend," says Prof. Owen, "that few naturalists nowadays, in describing and proposing a name for what they call 'a new species,' use that term to signify what was meant by it twenty or thirty years ago. * * * * The proposer

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of the new species now intends to state no more than he actually knows; as, for example, that the differences on which he founds the specific character are constant in individuals of both sexes, so far as observation has reached," etc. That is what I act on, and I believe the lepidopterists of this country do the same, as a body. In CAN. ENT., 21, 235, 1889, Mr. Lyman says: "I hold very strongly that whenever a form is distinctly and easily separable from previously named species, it is entitled to be treated as a good species, and to be given a specific name, until it is proved to be only a variety by breeding," etc.

Dr. Holland writes, after reading Mr. Elwes' paper: "Your course in applying specific names to constant, or apparently constant, varieties, is proper, no doubt. The species so called may be relegated at a later time to the rank of a mere variety; but science has been the gainer by the process." Professor Rivers, in his recent paper in Psyche, holds the same view. So does Mr. Grote in his new Check List.

In illustration of the two ways of working: In 1876, I described a certain yellow Colias from British Columbia as *C. Eriphyle*, being satisfied that it could not be *Philodice*, the then only described yellow species of the sub-group. In 1883, I named another yellow Colias from Colorado, that seemed to have distinct features, as *C. Hagenii*. Year after year I endeavored to get eggs of the Colorado form, and when at last I succeeded, the butterflies resulting showed that that *Hagenii* and *Eriphyle* were essentially the same thing, and both were a yellow form of the orange species *Eurytheme*.

Per contra, as an example of lumping without knowledge, quite after Mr. Elwes' own heart: Mr. Strecker, in his Catalogue, puts *Philodice* as a species, and *Eriphyle* as a variety of it—not only that, but *Occidentalis* and *Chrysomelas* as well, though these belong to a different sub-group from *Philodice*. Which was the more reasonable proceeding, to lump as varieties or synonymns several forms of which the lumper knew nothing, or to spot them as separate, and go to work to ascertain the facts?

In the same way I had separated the two orange Colias, *Ariadne* and *Keewaydin*, as species, and when the opportunity came for breeding them, they were proved to be polymorphic forms of *Eurytheme*. So two of the polymorphic forms of Papilio *Ajax* were reckoned, not only by me, but by Dr. Felder, as distinct species, till breeding showed them forms merely, but deserving a name of course. By naming and separating a probable

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species, attention is directed to it, it can never more be lost sight of, and sooner or later its true position will become established. But if several forms, of which nothing definite is known, are rolled into a lump, who can say that they will ever again be separated or even noticed!

In Mr. Elwes' revision of the genus Erebia he enumerated *Epipsodea*, and hesitatingly under it (with a query) a var. he thought worthy of a name, *Brucei*. He says he did not know whether to call this a var. or a species. He and Mr. Godman had each one specimen, and "it is so different from *Epipsodea that, had I more specimens*, I should be inclined to consider it a different species." So he puts it down as a var. with a query. If he had had more specimens—say one or two more—he would have done exactly what he is holding Mr. Edwards up to public reprobation for, put it as a species! Well, Mr. Bruce sent me eggs laid by the *Brucei*, and in due time one of them gave a typical *Epipsodea* imago. The indefinite knowledge has become definite.

On p. 569, larval characters are deprecated as a means of determining doubtful species, because the larvæ "are liable to vary" as much as the perfect insect. I will put my experience against the author's, and I say that the variation in the larvæ of each species of Argynnis is practically nothing.* They are as like each other as so many peas. When, therefore, I have reason to think, from the imago, that a certain form is a distinct species, as, for example, the one now known as *A. Cipris*, and which was called by Mr. Mead and myself the Rocky Mountain form of *Aphrodite*, but on my part always with doubts, if I can get eggs, I may find out the truth one way or the other. In case of *Cipris*, the larva and pupa showed a distinct species, and thereafter I had no difficulty in defining the geographical limits of *Cipris*. *Aphrodite* has a chocolate-brown larva and brown pupa, with no other markings; *Cipris* has both stages variegated and striped with yellow, and is as remarkable in its ornamentation

*There are many cases among the Heterocera, where the larvæ alone are relied on for distinguishing species, vide Weismann's Theory, p. 543, Eng. Ed. "In the Sphingidæ, cases are not wanting in which the moths are far more closely allied than the larvæ. This is especially striking in the genus Deilephila, eight species of which are allied in the imaginal state, in a remarkable degree, whilst the larvæ differ greatly from one another in color, and to as great an extent in marking." In the case of *D. Euphorbiæ* and *Nicæa*, whilst the larvæ show great differences * * * the moths *cannot be distinguished with certainty*. The imago of the rare *Nicæa* is, for this reason, wanting in most collections; it cannot be detected whether a specimen is genuine, i. e., whether it may not perhaps be a somewhat large example of *Euphorbiæ*."

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as *Idalia*. Suppose I had followed the example of the lumpers and *Cipris* had been overlooked altogether! What gain would have accrued?

I will lay down another rule that is infallible in Argynnis. Each species has its own style of silver spots, and there is practically no variation throughout the species, or in the range of it. *Coronis* Behr. abounds in South California, flies in all the intervening States to Montana, and in Oregon and Washington, and varies as much in coloration of both surfaces as any American species. But take it where we may, the great egg-shaped spots are always the same. It does not follow, though, that every specimen with egg-shaped spots is therefore a *Coronis*. *Cybele* always has silver spots of its own type; so has *Leto*, so *Nokomis*. In no case does one of these species approach the other. In *Macaria* the spots are at their maximum, in *Chitone* at their minimum; yet, in the list, both are put down as vars. of one other species. I would commend a careful course of study in these points to the author of the paper.

Mr. Elwes is sure that Mr. Edwards "will one day regret" having "in his earlier years created a great number of synonymns." I am sorry that he should be pained on my account. I am as much of a sinner in my later years as in my earlier, and have within a week described two species of Argynnis, which Mr. Elwes will regard as either "vars. or bona sp., or trans. ad *Zerene*." "His later views, as expressed in such papers as he has written on *P. Napi* and its vars., and in Lyc. *Pseudargiolus*, give evidence of a correct appreciation of the variation of species," for which condescending and patronizing approval I am duly grateful. But the illustration of L. *Pseudargiolus* is not so pat as was intended. I named both L. *Violacea* and *Neglecta* as species, and figured them as such in Vol I., Butt. But, when eggs were got, the whole curious and complicated relationship was made out, and these forms and several others were proven to be polymorphic forms of the one species *Pseudargiolus*. And I will venture to say I proceeded scientifically from first to last.

With regard to *P. Napi*, all I attempted to do was to show how a parent species could originate distinct derivative forms, and though I called all *Napi*, yet the derivatives, every one of them, are good and true species, or dimorphic forms of species, breeding true, not intermixing, and in the next edition of my Catalogue I shall put them down as such. I think I can see how the derivation from a single form occurred, but the derivatives are now species, and at present entirely separated from the parent *Napi*.

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Anyone who has collected, and studied, and bred butterflies for years will have ideas as to the limits of variation in each species, and he will judge forms newly presented to him by those which he already knows. The eastern Argynnids—seven species—show little variation except in size, and it is only *Cybele* and *Aphrodite* that show that, according as they are northern or southern. The others are remarkably constant. Neither of these species, whatever its variation, runs into another, or approaches another. No one but a novice can possibly mistake one for another. Judging by what I see of them, I do not expect to find much variation in the genus elsewhere, and in fact if there are any variable species in our fauna, they form the exception, not the rule. The greater part are certainly as well defined as *Aphrodite* and *Atlantis*. I believe all the 42 described species, unless perhaps *Clio*, to be good species, constant to type, breeding true. *Clio* may turn out by breeding to be a dimorphic form of *Eurynome*. I should be delighted to be the means of proving it, but till it is proven, I hold it as separate. As to *Artonis*, that it is distinct from *Eurynome* and *Clio* I have no doubt whatever. I know it is found abundantly where *Eurynome* does not fly, and of course it breeds to its own type.

On page 535, in this remarkable statement, when speaking of the Argynnides of all the world: "The difficulties in this genus are not so great as in Colias and Erebia, *except in the species* inhabiting the Rocky Mountains and Pacific States of North America, which run into each other in a most extraordinary manner. Most of the European species, though closely allied, are fairly distinct, and I have *only marked one species out of America as doubtful*." So far as relates to all the world, then, except these western districts of America, the rule I laid down holds good by Mr. Elwes' own admission, that the several species of Argynnis vary only within certain limits, and nowhere run into each other.

Mr. Elwes had only to make sure of his American species, which he could easily have done by seeing the original types, and he would have found his rule held good universally. But ignorant of the types, he started wrong, and trusting to what he calls authentically named specimens, received from experienced collectors, together with his lack of knowledge of the preparatory stages, or of what are the most important features of the imagos, he has landed where we find him.

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THE BUTTERFLIES OF LAGGAN, N. W. T.; ACCOUNT OF CERTAIN SPECIES INHABITING THE ROCKY MOUNTAINS IN LATITUDE 51° 25′.

BY THOMAS E. BEAN, LAGGAN, ALBERTA.

THE LOCALITY.—Laggan is a telegraph station of the Canadian Pacific Railway, 956 miles west of Winnipeg as the railway runs, and six miles east of the British Columbia eastern boundary. A mile west of Laggan the railway leaves the Bow River Valley, and turns more directly west into the valley of Noore's Creek to cross the central range of the Rocky Mountains, the summit of the pass being six miles from Laggan. Directly east of Laggan, Pipestone Creek, flowing from the north, joins the Bow; its sources are about twenty miles to the north, among the crags of the Sawback Range, only a few miles distant from the headwaters of the Red Deer River. A short distance west of Laggan, Noore's Creek enters the Bow: this stream, although scarcely ten miles long, carries, on warm days, a great volume of water, derived from an extensive snow field on the eastern face of the Waputtehk Range. The Bow River itself, rising about latitude 51° 45′, flows southeast for a long distance in an elevated shallow valley parallel to the axis line of the Rocky Mountains, and close to the basal slope of the central range of peaks. At Laggan, the surface of the river, at its ordinary summer level, is but three hundred feet below the elevation of the summit of Kicking Horse Pass.

The entomological ground, whose butterflies I propose to speak of, is chiefly a limited district immediately around Laggan, comprising, on the east, the valley of the Bow to a distance of four miles, and on the west the same valley for two miles; embracing on the southwest the valley of Noore's Creek, and the summit valley of Kicking Horse Pass to a point about three miles west of the British Columbia boundary; and extending on the north from the level of the Bow to the peaks of the nearest of the "Slate Mountains." A less complete examination has been made for nineteen miles east along the railway, and above timber line upon mountains at Stephen and Hector; also between the Bow River and Emerald Lake, three miles south.

As regards continental position, Laggan is about one hundred and sixty-five miles north of the international boundary, on a line with the western boundary of Montana, in the same longitude as the Great Slave

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Lake and the peninsula of Lower California. It is approximately in lati tude 51° 26′ north, and its elevation above the sea is recorded as 5,005 feet, only 290 feet less than that of the railway summit at the head of Kicking Horse Pass, while it is nearly a thousand feet higher than Morley, at the edge of the mountain district, and over three thousand feet more exalted than Regina, in the region of the central prairies.

To aid an estimate of the climatal and zoological conditions of the Laggan district, certain facts may be mentioned, partly of a general nature and partly local. The latitude of Laggan brings it about in line with the Aleutian Islands, Moose Fort on James Bay, and York Point, Labrador, while it is almost two degrees more northerly than Anticosti Island, and about four and a-half degrees further north than the city of Quebec. The district is thus seen to be considerably more northern in position than any other equally accessible North American entomological field which has been as fully examined. This district is on the warmer side of the continent. Although so much further north than Mount Marcy in the Adirondacks, on which timber line occurs at 4,850 feet, and the White Mountains of New Hampshire with timber line at 4,250 feet, yet the mountains about Laggan lift their forests to a far greater altitude, the uppermost fringe of larches illuminating timber line in September with a soft yellow glow at a height of 7,000 feet. The difference in the climate of western British America from that of the eastern side is illustrated by the occurrence of rattlesnakes at the "Forks of the Red Deer River," in the warm plains east of the mountains; the locality is nearly due east from Laggan, and is in the latitude of Southern Labrador.

The *local* conditions of the Laggan district, however, are distinctly of a boreal tendency. So great is the altitude of the Bow Valley that the railway grade is but 2,000 feet below timber line; in the vicinity of Pike's Peak, Colorado, an equal relative position would be met with at an altitude of 9,700 feet. The valley of the Bow, indeed, is but a comparatively narrow pass, parting two great systems of chaotic upland, where peak is frozen to peak by an almost unbroken line of glaciers—every sunless height a field of snow, each shaded alpine abyss a gulf of ice. As may well be supposed, these frigid environments powerfully affect the summer climate of the region, and exert a controlling influence upon the night atmosphere even when the days are warmest.

Among the noteworthy features of the scenery may be mentioned:

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Mount Hector, in the northwest; Mount Temple, about eight miles southwest, with a great field of snow and ice on its summit a mile above the valley; Mount Lefroy, seven miles to the south, and the glacier of Noore's Creek, nine or ten miles west; also Emerald Lake, three miles south of the Bow, and the various rapids and canons of the Bow and Pipestone.

For names and figures made use of, I am indebted chiefly to the "Geological Survey of Canada" and "Gannett's Dictionary of Altitudes."

Preliminary to a consecutive list of the Laggan butterflies, to be written when all the material is sufficiently understood, I propose now to present such details as are likely to be of interest in regard to some of the least familiar of these Western Alberta autochthones.

COLIAS ELIS Strecker; its seasons and variations, with information in regard to the male :—

This fine butterfly was first collected by Capt. Geddes, who records the capture of the female at Laggan, on Aug. 1st, 1884—the only definite date I find in print. The reason the Captain did not find the male was because it was not lost, but gone before. Capt. Geddes also catalogues *Colias Meadii* Edw., as collected at Laggan in the season of 1884.

Mr. Strecker's description of *Elis* may be found in "Proc. of the Acad. of Nat. Sciences of Philadelphia" for 1885, pp. 24–25. Mr. Strecker says :—

"Capt. Geddes took about fifteen examples, all females, nine of the orange form, and about six of the white; but nothing that could possibly be considered as the male. The other examples of *Colias* captured in the same locality were lemon-coloured males and females probably of one species, and allied to *Pelidne*, but bearing no kinship to the above. The most remarkable and distinctive feature of this *C. elis* is the white female; as the species, I am positive, will be found, whenever the male is discovered, to belong to a group in which albinous females are unknown, its congeners being *Hecla*, *Hela*, *Staudingeri* and *Eogene*, species in which no instance of the pale female has yet been known to occur; all of which are found only at great altitudes, or at the North Polar Regions, and are in the male distinguished from the other red or orange species by the absence of the mealy kidney or oval-shaped spot on the upper surface of the costa of secondaries near the body.

"It is curious, in regard to these albinous females of the Coliades,

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that in one group they should occur in one species only, whilst in another there should be but one species, *C. Meadii*, found also at great elevation, in which they do not occur; and in yet another species, *C. Vautierii*, of the same group with the last mentioned *Meadii*, found in Chili, the female is always white, such a thing as a red one being entirely unknown."

I find nothing in print from Capt. Geddes as to the elevation at which he found his specimens of *Elis*. Mr. Strecker states it as ten thousand feet, but that is evidently incorrect: timber line in the region occurs at about seven thousand feet, and the habitable belt extends but little more than a thousand feet above that elevation, while comparatively few of the ultimate barren peaks reach a height of ten thousand feet. *Elis* is by far most frequent at a little over five thousand feet, and is often met with in appropriate localities up to about six thousand feet; it is rarely seen much higher than about six thousand feet, and never in my experience found above the tree line.

In regard to the distribution of *Elis*, I have little information. It is known to me only as inhabiting a very limited district. Eastward it becomes less frequent quite abruptly, and I have not seen it further east of Laggan than four or five miles; it probably drops out of the fauna entirely on the east within ten miles of Laggan. To the southwest, across the summit, I have found it only as far as Hector siding, three miles west of the height of land; beyond Hector its territory cannot extend far, as the decrease of altitude on the west slope at the head of the pass is very rapid, amounting to one thousand feet in the first six miles. The entire extent of the range of *Elis* from east to west, as known to me, is not more than thirteen miles. As to the distribution north and south, along the central line of the mountains, nothing is known, but in that direction its empire may be extensive. An interesting problem it is: How far the domain of *Elis* extends north and south from its thinly settled reserve on the Bow?—how far northward along the narrowing angle of the upper Rockies toward the wide-spread country of *Hecla*?—and southward, how far across a thousand miles of intervening mountainous wilderness toward the ancient villages of *Meadii* on Colorado's cloudy summits? Within the narrow limits of its known district, *Elis* is of general occurrence in localities where its food plant grows, though at few points is it ever anything but rare. A part of the best locality known to me was devastated by the fires just east of Laggan in June, 1889. *Elis* has partially established itself upon the high flats and hills between Laggan and the nearest,

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mountains north, a district burned a few years ago, and will, no doubt become more frequent there in future years, as its food plant is abundant. At the summit, this butterfly and most others were well nigh exterminated in the summer of 1886 by the storm of fire which raged through the pass, sparing nothing but the little marshes and their inhabitants. Collecting there several times in 1888 and 1889, I saw scarcely a butterfly other than the two species of *Chrysophanus*, which live at the edges of the little swamps. These were as frequent at the summit as I found them in their resorts elsewhere. The larger butterflies, however, were lacking or were excessively rare, excepting only *Pieris occidentalis*, which seemed to have in some degree regained a footing.

The ♂ of *Elis* flies chiefly from about the 28th of June to the end of July. My initial date in 1886—an early season—was June 23. After July few ♂s are seen, and those few not newly out of chrysalis. The ♀s are abroad during a period about equal to that of the ♂s, but beginning and ending a few days later; my collection dates indicate a term of about five weeks, say from July 6th to August 10th or 12th. The ♂ is most frequent near the middle of July, and the ♀ a week or ten days later. The total period of the imago, including both sexes, varies in different seasons from a term of thirty-five to one of forty-five days: during the last five to ten days there are seen none in good condition—the females appear in faded finery, and rarely a tattered male lingers among the asters. There is but one flight in a summer. No indication of hybernation in imago or pupa has come to my notice. All the evidence so far obtained tends to show that the larva invariably hybernates at a very early stage, almost certainly at first stage, and that the species, in its habit of development, is a strict biennial.

Admitting *Elis* to be a distinct species, it is without doubt extremely near to *Meadii*, far closer than to any other well known form; this the ♂ especially proves. Probably its description as a distinct species was immediately due to the incident of failure to collect ♂s in the first instance.

Definite Characters of the ♂.—Material examined, twenty-nine caught specimens. The smallest measures 48 mm., or 1.9 inch; the largest is 57 mm., equal to 2.24 inches. These measures are obtained by adding the length of the two primaries (measuring from apex to centre of base of wing) and the breadth of the body. Average expanse of the twenty-nine individuals 51.2 mm., or 2.01 inches. This is a larger butterfly than *Meadii* or *Hecla*. It is smaller than *Christina*, or even *Alex-*

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andra, being nearer the expanse of *Edusa*, *Myrmidone* and *Thisoa*, and to the last one it has a more than superficial resemblance. The border of primary varies greatly in breadth in different individuals, ranging from 2.5 to 4.5 mm. in my specimens, measured at middle of outer margin: this is an important point of contrast from *Meadii* ♂, in which the breadth of the border of primary, in different individuals, is peculiarly uniform. At apex the border is not usually so broadly produced proportionally as in *Meadii*, but more nearly as in *Hecla*. At inner angle, the border is generally much produced, in which it follows the method of *Meadii* and differs from *Hecla*. As a general statement, the border of both wings is relatively much less produced in *Elis* than in *Meadii*. In the shape of the border of primary, *Elis* differs from *Meadii* definitely, though slightly, but its difference from *Hecla* is emphatic and essential. A more detailed comparison between *Elis*, *Meadii* and *Hecla* may be attempted later, with a more ample material of *Meadii* for inspection. At present it may safely be said that *Elis* is on upper surface partly near *Meadii*, and in part more like *Hecla;* that its resemblance to *Hecla* is comparatively superficial, while in essentials it is nearer *Meadii*, yet is not quite identical in the method of its pattern. On under side the differences between *Elis* and *Meadii* are not definite, nor very considerable. The cell-spot above primary is uniformly small, often sub-linear, and in six of the twenty-nine it is almost obsolete. Under hind wing the cell-spot is also small, but in five of the twenty-nine specimens it is faintly double. The presence of submarginal dark spots on under surface is scarcely to be called a feature of *Elis*, though slight traces of this submarginal row occur in twelve of the specimens. The same is true as to the "patch," or cluster of dark scales, found on costa beneath secondaries in many species of *Colias;* in *Elis* it is but feebly exhibited, traces of it being found in only seven of the twenty-nine males. Details of this kind do not constitute very interesting reading, but they are important. Such features as the cell-spots of both surfaces, the submarginal row of spots, and the costal "patch" on under side, and the nature of the marginal border on upper surface of wings,—when their averages in the several *Colias* forms have been fully collated from ample representative material of both flown and bred specimens—will prove to be efficient criteria in determining the standing of these forms.

(To be continued.)

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 75, Volume xxii.)

Genus NEMEOPHILA Steph.

1830—Steph., Ill., Brit. Ent., Haust., II., 72.
1855—Wlk., C. B. Mus., Lep. Het., III., 623.

Head small, not retracted, with rough vestiture. Eyes small, yet somewhat bulging or prominent. Tongue moderate in length, but weak. Palpi short, straight, scarcely projecting beyond the clypeus, clothed with short, thin vestiture. Ocelli present. Antennæ moderate in length, the ♂ rather lengthily bi-pectinated. Legs unarmed, subequal, the posterior longest, rather closely scaled, the spurs distinct.

Primaries with accessory cell distinct, giving off 7-10 from its apex, 4 and 5 close together, well separated from 3.

Secondaries with 3, 4 and 5 almost equidistant from the end of the submedian; 6 and 7 together from the end of the subcostal, which latter gives off 8 from about the middle of its course.

The species in this genus are variable and the relation of the described forms is by no means fixed. As usual I follow Mr. Grote's List, without, however, intending to subscribe to the correctness of the synonymy.

N. geddesi Neum.

1883—Neum., Papilio III., 137, *Nemeophila.*
Habitat—N. W. Brit. Col.

N. modesta Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 113, *Platarctia.*
1882—Grt., New List, 16, *Nemeophila.*
Habitat—California.

N. petrosa Wlk.

1855—Wlk., C. B. Mus., Lep. Het., III., 626, *Nemeophila.*
1872—Pack., 4th Rept. Peab. Ac. Sci., 85, *Nemeophila.*
1874—Streck., Lep. Rhop., et Het., I., 79, =*plantaginis.*
1878—Streck., Pr. Dav. Ac. Sci., II., 272, pl, IX., ff. 2-4, =*plantaginis* Linn.
1879—Strk., Rept. Chief Eng., 1878-79, V., p. 1859, =*plantaginis.*
1882—Stretch, Papilio, II., 92 (variations), *Nemeophila.*
var. *cæspitis* Grt. & Rob.

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1868—Grt. & Rob., Trans. Am. Ent. Soc., I., 337, pl. VI., f. 43, *Nemeophila.*
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 75, *Nemeophila.*
1873—Grt. & Rob., Trans. Am. Ent. Soc., IV., 248, *Nemeophila.*
1879—Strk., Rept. Chief Eng., 1878-79, V., 1859, =var *plantaginis.*
var. *cichorii* Grt. & Rob.
1868—Grt. & Rob., Trans. Am. Ent. Soc., I., 338, pl. VI., f. 44, *Nemeophila.*
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 75, *Nemeophila.*
1873—Grt. & Rob., Trans. Am. Ent. Soc., IV., 428, *Nemeophila.*
1879—Strk., Rept. Eng, 1878-79, V., 1859, =var. *plantaginis.*
var. *geometrica* Grt.
1865—Grt., Proc. Ent. Soc., Phil., IV., 318, pl. II., f. 1, *Eupsychoma.*
1872—Pack., 4th Peab. Rep., 86, =*petrosa.*
1875—Pack., Rept. Geol. Surv. for 1874, 559, *Nemeophila.*
1878—Strk., Proc. Dav. Ac. Sci., II., 272, pl. IX,. f. 3, *plantaginis.*
1879—Strk., Rept. Chief Eng., 1878–79, V., 1859, *plantaginis.*
1879—Grt., CAN. ENT., XI, 209, *Nemeophila.*
geometroides G. & R.
1868—Grt. & Rob., List N. A. Lep., p. VIII., *Eupsychoma.*
ab. *hospita* Schiff.
1878—Strk., Proc. Dav. Ac. Sci., II., 272, *Nemeophila.*
Habitat—Calif., Rocky Mts., Colo.

A very variable species. Mr. Strecker mentions the early stages in his paper in the Rept. Engin. for 1878–79, and refers everything to *plantaginis.* How far he is correct I will not venture to say at present; but this much I can say, I have never in all the series seen by me found anything which was like the series of European specimens. That all these names refer to one variable species is not, I think, disputed.

N. scudderi Pack.
1864—Pack., Proc. Ent. Soc., Phil., III, 113, *Platarctia.*
1872—Pack., 4th Rept. Peab. Ac. Sci., 86, *Nemeophila.*
Habitat—Brit. Amer., Calif.

N. selwynii Hy. Edw.
1885—Edw., CAN. ENT., XVII., 65, *Nemeophila.*
Habitat—Ontario.

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Genus SEIRARCTIA Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 119.
1873—Stretch, Zgy. & Bomb., 81.

Antennæ of ♀ short, with joints marked but scarcely serrate, the sides ciliated. Head moderate in size, closely applied to the thorax, but not sunken. Tongue obsolete. Palpi short, third joint equal to the second in length, not much exceeding the first; straight. The eyes are rather large, but not prominent. Ocelli present. Vestiture long and hairy. Legs short, fore-tibiæ shorter armed with a long claw at tip, middle and posterior tibiæ nearly equal in length, each armed with a pair of short terminal spurs only.

No male has been under examination, and I cannot therefore speak of the characters of that sex.

Primaries without accessory cell, seven to ten on a stalk out of the end of the subcostal at the same point with six; ten from nearest to base of stalk to costa; seven next to outer margin; eight and nine forking close to tip, the former to apex, the latter to costa; four and five together from the end of median; three from median some little distance before the end. Secondaries six and seven together from end of subcostal; four and five together from end of median; three some little distance before the end; eight, as usual, from about the middle of subcostal.

These studies were all made on a ♀, *S. echo.*

S. clio Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 120, *Seirarctia.*
1872—Stretch, Zyg. & Bomb., 82, pl. 3, f. 1, *Seirarctia.*
1882—Behr.,* Papilio II., 187, biol. notes.
Habitat—California.
Food plant—*Apocynum androsænifolium.*

S. echo Sm. & Abb.

1797—Sm. & Abb.*, Ins., Ga., II., 135, pl. 68, *Phalæna.*
1816—Hübn., Verzeichniss, 184, *Estigmene.*
1856—Wlk., C. B. Mus., Lep. Het., III., 668, *Spilosoma.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 531, *Hyphantria.*
1862—Morris, Synopsis, Supplt., 342, *Spilosoma.*
1864—Pack., Proc. Ent. Soc., Phil., III., 120, *Seirarctia.*
1865—Wlk., C. B. Mus., Lep., Het., XXXII., 352, *Hyphantria.*

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1889—Slosson*, Ent. Amer., V., 153, larval habits.

1890—Slosson*, Ent. Amer., VI., 8, larval habits.

Habitat—Georgia, Florida, Dist. Col.

Food plants--Oak, Persimmon, Palmetto: omnivorous.

Seirarctia bolteri does not belong to this genus, and has been referred by its describer to *Halisidota ambigua*.

Genus *Ectypia* Clem.

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 529.

E. bivittata Clem.

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 530, *Ectypia*.

nigroflava Graef.

1887—Graef., Ent. Amer., III., 43, *Spilosoma*.

Habitat—Texas.

A poor specimen of this species is in the collection U. S. National Museum, also from Texas. I did not recognize it as Clemen's species until I had identified it with Mr. Graef's description. Mr. Hy. Edwards subsequently called Mr. Graef's attention to the probable synonymy, and there remains no doubt that Clemens' species is again known in collections. I have no notes on the genus, and believe it will either not prove a good one or some other must fall in with it.

Genus PYRRHARCTIA Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 120.

Head small, somewhat retracted. Tongue short and weak. Palpi very short, scarcely reaching the front. Antennæ very short, simple in both sexes. Legs stout, moderately long; spurs short, middle tibiæ with one, posterior with two pairs. Fore tibiæ without armature. Claws with tips toothed.

In venation this species does not differ from *Leucarctia*, which will be fully described in this respect. The remarkable male characters of this genus have been described and figured by me.

P. isabella Sm., Abb.

1797—Sm., Abb.*, Lep., Ga., II., 131, pl. 66, *Phalæna*.

1816—Hübn., Verzeichniss, 184, *Estigmene*.

1833—Harris, Cat., Ins., Mass., 591, *Arctia*.

1841—Harris*, Rept. Ins., Mass., 59, *Arctia*.

1855—Wlk., C. B. Mus., Lep. Het., III., 611, *Spilosoma*.

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 531, *Spilosoma*.

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1862—Harris*, Inj. Ins., Flint ed., 335, f. 170, *Arctia.*
1862—Morris, Synopsis Lep. Supplt., 340, *Arctia.*
1862—Clem., App. to Morris Syn., 352, *Spilosoma.*
1863—Saund., Syn. Can. Arct., 16, *Spilosoma.*
1864—Pack., Proc. Ent. Soc., Phil., III., 121, *Pyrrharctia.*
1869—Saund.*, CAN. ENT., I., 26, *Spilosoma.*
1870—Riley*, Am. Ent., I., 48, *Arctia.*
1871—Riley*, Am. Ent., II., 182, f. 112, *Arctia.*
1872—Riley*, 4th Rept. Ins., Mo., 113, f. 65, *Arctia.*
1873—Edw.*, Proc. Cal. Ac. Sci., V., 187, 370, *Pyrrharctia.*
1876—Moeschl., Stett. Ent. Zeit., 37, 297, *Pyrrharctia.*
1878—Mann*, Psyche, II., 270, *Spilosoma.*
1880—Riley*, Am. Ent., III., 133, f. 51, *Arctia* (life hist.).
1881—Riley*, Gen. Index to Mo. Rep., 55, *Pyrrharctia.*
1882—Coleman*, Papilio, II., 18, *Pyrrharctia.*
1883—Weed, Papilio, III., 84, *Pyrrharctia.*
1884—Bean*, CAN. ENT., XVI., 67, *Spilosoma.*
1886—Smith, Ent. Amer., II., 79, *Pyrrharctia.*
1888—Dimmock (A. K.)*, Psyche, IV., 281, *Spilosoma.*
Coleman, Journ. Bost. Zool. Soc., I., 28, *Spilosoma.*

californica Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 121, *Pyrrharctia.*
1872—Pack., 4th Rept. Peab. Ac., 86, pr. syn.
1873—Butler, Cistula Ent., II., 39, pr. syn.
Habitat—United States and Canada.
Food plants—Omnivorous.

(To be continued.)

CORRESPONDENCE.

ERRATA TO THE REVISED CHECK LIST OF N. AM. NOCTUIDÆ.

Dear Sir: Although the list was nearly three months in press, from end of December to beginning of March, and I had a large number of proofs, I find that three mistakes escaped correction which I desire to note in this place:—No. 211, for *Harv.* read *Harr.;* No. 359, for *Harv.* read *Harr.;* No. 802, for *Grt.* read *Morr.* Students using the list will please note these necessary changes.

April, 1890. A. R. GROTE, Bremen, Germany.

Mailed May 2nd.

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The Canadian Entomologist.

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THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA COMPARED.

(Seventh Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

We have now passed in brief review the bombyciform *Noctuidæ*, or *Thyatirinæ*, and the typical *Noctuidæ*, or *Noctuinæ (Noctuæ nonfasciatæ)*. The former group differs in certain details of the neuration, and the question comes up as to the value of this character for classification. In all other respects, this small assemblage of moths must be considered as belonging to the *Noctuidæ*. The palpi, though short, have the Noctuid form. The eyes are sometimes naked, sometimes hairy. The legs, though somewhat short, are not unlike those of other owlet moths; the fore pair have a tibial epiphysis so far as known to me. The fore wings are subtriangular with pointed apices. The resemblance to the *Notodontinæ* is seen in the neuration of primaries where vein five is intermediate, though this vein is sometimes wanting in the Bombycid group. But in *Nolaphana*, which Fitch considered a Tortricid, Zeller at first a Nolid, vein five seems also intermediate. This character of vein five of fore wings is, perhaps, of more value than the variations of the secondary costal veins. The difference in the position of vein seven of hind wings is, perhaps, not so important when we see that, in *Stilbia* and *Rivula*, vein eight springs from seven, the upper margin of the median cell. This is also the case with *Cerathosia*, and we may briefly consider the position of this moth. The name is derived apparently from the Greek *Keras*, a horn, in allusion to the clypeal tubercle perhaps; and *thosia*, whatever that may be, I know not. It looks like a piece of *Lithosia*, a name derived from the Greek *lithos*, a stone, so that it might seem as though Mr Smith intended

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to classify the moth as a Lithosian before asserting it to be an Arctian, "next to Utetheisa." I have already pointed out Mr. Smith's misstatements as to the neuration. These corrected, we have before us a Noctuid in all structural characters, except that the secondaries have vein eight of seven; but thus also paralleled by *Stilbia*. On the fore wings vein five originates near four, and runs nearer four than six. The clypeal tubercle and the legs, with a claw on fore-tibiæ, recall, as I have said, the *Stiriini*, and, so far as I can see from my six specimens, the tegulæ do not lie close to the thorax. But the squamation resembles that of *Tarache*, and we may place the moth after this group and before *Spragueia* and the *Eustrotiini*. Since 1868, I have been occupied in bringing our *Noctuidæ* into natural genera, founded on characters exposed by Lederer, characters used also by prominent recent specialists, such as Prof. Fernald and Lord Walsingham. It is therefore ridiculous for Mr. Smith to accuse me of ignorance of Lederer's definitions. But it will be better not to discuss any further Mr. Smith's remarks on this genus. The question whether relatively slight variations in the neuration can establish natural families in the Lepidoptera, is not to be decided after the fashion of Mr. Smith, but must be reasonably discussed. I have shown cases of individual variation in neuration, and science has not yet removed the scales and studied the veins of all the species of moths. We must not fall into the fault of tucking away an insect under a scientific label, but constantly occupy our minds with its various characters until its affinities become clear to us.

We may now enumerate the tribes into which I have divided the *Noctuinæ*. It may be premised that the genera thus associated may, in some instances, need transference. The limits between certain of these tribes seem faint, and I have had to rely often on somewhat vague and general characters for their definition. Unlike the Coleoptera, the investigator of the Lepidoptera is often at a loss to find structural features, so uniform is the general character, so soft the body parts, clothed with dense hair and scales, difficult to remove so that the external skeleton be studied. I have recognized the divisions of tribes, sub-families and families, and have endeavored to follow Leconte in his classification of the Coleoptera in my nomenclature. I think we should make a distinction between the characters employed for these divisions, and that we should not allow for a subordinate structural character a "family" value. On

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this head the student is referred to a most valuable paper by Dr. Packard on the *Noctuidæ*, published in the Proceedings of the Portland Society of Natural Sciences, I., 153. This paper should be reprinted. It speaks of the natural value of the great families of moths, and contains statements of fact and admonitions to students, which can only be disregarded to the detriment of the study. From the relative intangibility of the structural characters of butterflies and moths, arises some necessary latitude of opinion. In no case is there any excuse for an improper criticism of the opinions of older or of more experienced writers. Rather is there room for a gentler treatment of this subject of our moths, these pretty locks of nature's fleece, so tender and so fleeting! In the paper above alluded to, Dr. Packard complains of the effect of amateurism on the literature of the science. No doubt in one sense the remark is well founded, but this amateurism is rather a proof of the attractiveness of the study and its aesthetic value. For my part I should be glad of the largest possible accession to the ranks of butterfly hunters and students, and I have tried always to do what I could toward creating a larger interest in this field. Elsewhere I have drawn attention to the greater general interest felt in England on the subject, and how valuable an addition to the charms of life the collection of butterflies and moths is proved to be. For this reason I have favored the gradual use of English names, and I have looked forward to the time when the distinction between "amateurs" and "scientists" should be obliterated by good work being done on all hands. Far more do I incline to disapprove of the work of those, whose temperament and training allow them to misrepresent what others have said and done, in order to ease their wounded vanity, or rise by improper criticism. Let us forsake such conduct. We are, as Mr. Scudder would call us, Aurelians, although this title smacks a little of the hobby, and it were well if our kinship in interest would make us kind. There cannot be an agreement, as the world is infinitely diverse.

The tribes of Noctuinæ I have defined are:—1, *Bombycoidi;* 2, *Apatelini*, including *Bryophila*, although the disposition of the American genera is not settled between these two first tribes; 3, *Agrotini;* 4, *Dicopini*;* 5, *Hadenini;* 6, *Arzamini*;* 7, *Nonagriini;* 8, *Scolecocampini;* 9, *Nolaphanini**, only *Nolaphana;* 10, *Caradrini;* 11, *Orthosiini;*

* These groups do not occur in the European fauna.

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12, *Calocampini*, only *Lithophane (Xylina)*, *Lithomia*, *Calocampa* and *Xylomigis*; 13, *Cleophanini*, only *Cleophana*. I regard *Nyctophœata* as a Heliothid; 14, *Cuculliini*; 15, *Eurhipiini*; 16, *Ingurini**; 17, *Anomiini**; 18, *Litoprosopini**; 19, *Calpini*; 20, *Stiriini*; 21, *Plusiini*; 22, *Heliothini*; 23, *Tarachini*; 24, *Cerathosiini*; 25, *Eustrotiini*; 26, *Hyblœini*.

There remain to be considered the geometriform *Noctuidæ*, or the *Catocalinæ (Noctuæ fasciatæ)*, the pyralidiform *Noctuidæ*, or the *Deltoidinæ* and a small sub-family group, the *Brephinæ*, containing only two genera, with few species, found in northern latitudes and elevations over Europe, Siberia and North America, a relic of a preglacial fauna. The genera are *Brephos* and *Leucobrephos*.

As may be drawn from the above names applied to the leading groups, the *Noctuidæ* are a large family, with various resemblances to the surrounding families of moths. The Owlet moths touch the Spinners, the Spanner and Sparkler moths, while the typical *Noctuinæ*, from their total form and embryology, bring the whole family, in a linear arrangement, between the two first. In number of species and structural variation the *Noctuidæ* yield to no other in interest, and its large representation in North America commends it to the attention of the student. For the student I have at least originally shown the way his studies in this group should be carried on. The matters of detail have not always seemed so important to me as the method, and this method I have originally introduced into the study, combining my reading with observations under the microscope. There is growing up a tendency, especially in Europe, where the living material is wanting, to engage in a sort of book working of nature. The new student constructs, out of the writings and pictures of others, some new turn to our views of life and variation, fancying even that Darwin may be damaged by such methods. It is vanity displayed in vain.

Sub-family *Catocalinæ*.

The earliest recognition of this group which I find in literature is that of Borkhausen, who calls this *Noctuæ fasciatæ*, in contradistinction to the *Noctuinæ*, or *Noctuæ nonfasciatæ*. These terms are clumsy and had better give way to those proposed by Packard (Proc. P. S. N. H., Vol. I., 153, et seq.). The wings are broad; primaries triangulate; secondaries

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full, tending to be marked by continuous bands. The eyes are naked; antennæ generally simple; body usually untufted; abdomen smooth and tapering; the dorsal surface rarely crested; the tibiæ not unfrequently armed. Packard says that the epicranium is longer than in the *Noctuinæ*. The basis of this sub-family is comparative form. No single structural feature holds the genera together, and Lederer does not recognize its existence. Nevertheless the moths and larvæ seem to me more or less readily distinguishable, and that we may retain the sub-family term. Dr. Packard says (l. c.) that these two sub-families "agree in the main with the *Trifidæ* and *Quadrifidæ* of Guenèe, though the use which he makes of the venation seems to us to lead to artificial distinctions. The very constant venation of this family does not admit of any variation in the grouping of these veins and their branches, and hence they offer characters of secondary importance." With this statement my experience fully agrees. I do not think that the venation alone should decide family position. There are already too many exceptions known to the system of Herrick-Schæffer, which is, in some cases, considered the test of family character by Lederer. I regard this paper of Dr. Packard's as of fundamental value in the study of the *Noctuidæ*; the author, however, excluded the Deltoids, which, I think, from *all* their characters are *Noctuidæ*. It is not at all clear also, whether Dr. Packard considers the *Thyatirinæ* as a distinct sub-family group. Probably not, and that they are merely a tribal division of the *Noctuinæ*. To this view I should not seriously object, although I do not venture to decide upon it. The unequal characters by which we separate the *Thyatirinæ* and *Brephinæ* from the rest of the *Noctuidæ* are an objection to Lederer's classification. In the present series of papers the object is mainly to compare the fauna and the full discussion of this and similar points, must be left to a future occasion. Primarily this sub-family falls into two groups:—First, the tribe *Catocalini*, in which the secondaries, though often gaily coloured, are covered by and subordinated to the primaries. The European genera belong chiefly to this tribe. Secondly, the *Pheocymini* (*Pheocyma*, *Homoptera*, *Erebus*, etc.,) in which the secondaries are partially exposed and marked like the forewings, decidedly geometriform moths. The larva thus first becomes geometriform as we recede from the higher *Noctuidæ*, and then the perfect insect follows suit.

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NEW NORTH AMERICAN HOMOPTERA.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

IDIOCERUS CRATÆGI, n. sp.

Soiled white. Antenpal depression, a dot on each ocellus, a pair of large round spots on the vertex, an angular spot behind each eye, the basal angles of the scutellum, the tergum and disc of the pleural pieces, black; the elytra whitish hyaline generally with fuscous nervures. Length about 6 m.m.

Front slightly convex, the sides gradually converging to the rounded apex. Clypeus narrow, at the apex abruptly but not widely expanded; loræ rather narrow; outer margins of the cheeks feebly concave. Pronotum short, hind edge obscurely concave, the posterior angles rounded.

Colour soiled whitish; tinged more or less with yellowish green on the margins of the vertex and face, sides of the pronotum, scutellum, basal and costal nervures of the elytra, and on the connexivum. A curved longitudinal cloud on each side of the front, and two subtriangular oblique spots between the ocelli, brown; these marks may be obsolete, or they may be deepened to piceous black in places. A narrow triangular spot below the antennæ, a dot on each ocellus, and a large round spot above the latter on the vertex, deep black. Eyes brown. Antennæ white, setæ brown. Pronotum with an oblong black spot on the anterior margin behind the inner angle of each eye, disc sometimes with an indistinct brownish cloud. Scutellum with a large triangular spot within each basal angle, and two dots before the transverse depression, black; the middle of the anterior field sometimes clouded with brown. Elytra whitish hyaline, ordinarily with heavy brown nervures; the shoulder, commissure and claval suture yellow, costal nervure at base brown. Wings slightly smoky, iridescent; nervures brown. Pleural pieces black, edged with pale yellow. Legs soiled white, tarsi black. Tergum black; connexivum yellow; venter yellowish, sometimes clouded with brown, laterally; pygofers in both sexes black, edged with pale.

Genital pieces, male: Last ventral segment large, subtriangular, convex, longer than the two preceding, and covering the pygofers for about

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half their length; the latter broad and short, almost cylindrical, meeting on the ventral aspect nearly to their tips, thus forming a small opening around the anal style, a little separated basally beneath the ultimate ventral segment; plates slender, weak and flaccid, but slightly exceeding the pygofers in length, fringed with long soft hairs. Female: Last ventral segment as in the male, except that the apex is truncated or slightly concave; pygofers short and thick, the blunt apex but little exceeded by the ovipositor.

Buffalo, N. Y., July and August, occasional on thorn bushes; Hamilton, Ont., James Johnston, Esq. Described from five male and six female examples.

Allied to *I. lachrymalis*, from which it can be readily separated by its smaller size, different markings, and the form of the genitalia.

L'Abbe Provancher, in his Petite Faune Ent. du Canada III., p. 288 (Jan. 1890), describes a very pretty little species of *Idiocerus* as *Bythoscopus clitellarius* Fitch, with the reference "Third Rept. Inj. Ins. p. 69"; this should have read No. 69, and may be found on p. 365 of the Trans. N. Y. State Agl. Soc. for 1856. Fitch, however, here refers to *Jassus clitellarius* Say, a species of *Thamnotettix* and not to the insect described by M. Provancher, for which I now propose the name *Idiocerus Provancheri*. This conspicuous little insect pertains to the group represented by *I. maculipeunis* Fitch. It is not uncommon here at Buffalo on oak and other bushes through June, July and August. I have also taken it at Muskoka, Ont., and have seen examples captured at Hamilton, Ont. by Mr. James Johnston.

Since the publication of my paper on Pediopsis in Ent. Am. for Sept., 1889, I have received from M. Provancher a pale example of *Bythoscopus fenestratus* Fitch., labelled *Pediopsis flavescens* Prov., and accompanied by a note stating it to be a typical example. It agrees well with his description in the Nat. Can., IV., p. 376, Dec., 1872, and it is the insect described as *Pediopsis flavescens* on p. 295 of the Petite Faune Ent. du Can., Feb., 1890. This, therefore, leaves the insect described by me as the *flavescens* (Ent. Am., V., p. 173, No. 7) without a name. It is a well characterized species, and may be called *Pediopsis canadensis*.

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PLATYMETOPIUS FRONTALIS n. sp.

Smaller and shorter than *P. acutus*. Blackish fuscous, sparingly irrorate with pale; face pale yellow. Length about 4 m.m.

Vertex shorter than in *acutus*, one-quarter longer than broad between the eyes, with a longitudinal depression, apex obtuse. Cheeks broader, and the clypeus shorter and broader than in *acutus*, the sides of the latter almost rectilinear. Head, scutellum and abdomen, closely punctured. Pronotum smooth, obscurely transversely wrinkled. Last ventral segment of the male rather deeply concave, valve large and rounded; plates triangular, on the impressed suture about as long as the valve, apex subacute, margins sparsely ciliate; pygofers elongated, surpassing the plates. Last ventral segment of the female broad, slightly keeled and compressed apically, the hind edge feebly notched on the middle, pygofers short and broad, scarcely exceeded by the ovipositor.

Colour fuscous, or almost black; posterior disc of the vertex, pronotum, scutellum, and all beneath, minutely but sparingly irrorate with pale; vertex and venter of the male almost immaculate. Apex of the vertex whitish, with some irregular fuscous lineations on either side of the central line; face yellow, cheeks infuscated exteriorly, base of the front with but faint indications of the concentric lines characteristic of our other species. Pronotum, with five whitish longitudinal lines, faintly indicated. Nervures of the elytra bordered with interrupted pale lines that sometimes form reticulations on some of the areoles; costal area outwardly whitish hyaline, crossed by about eight oblique blackish veinlets; apical areoles, excepting on their base fuscous, the extreme edge pale. Elytra normally with about fifteen round whitish dots placed on the ends of the areoles, but more or less of the basal are frequently wanting. Wings sordid hyaline, nervures fuscous. Tibiæ spotted with pale; tarsi pale, the joints tipped with black.

Described from two ♂ and five ♀ examples. Buffalo, N. Y., June and September; Ames, Iowa, (H. Osborn).

I have swept this species from low bushes and weeds with *P. acutus*, from which it may readily be distinguished by its smaller size and blackish colour. *P. acutus* has the sides of its clypeus concave, and the apex of the valve of the ♂ obtusely pointed. *P. modestus* Stæl is unknown to me, as is also *P. magdalensis* Prov., but these are larger pale species.

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DESCRIPTION OF A NEW SPECIES OF ARGYNNIS FROM CANADA.

BY W. H. EDWARDS, COALBURGH, WEST VA.

Argynnis Alberta.

Belongs to the *Chariclea* group.

Male.—Expands 1.9 inch. Upper side pale yellow-fulvous; the markings as in *Helena*, but pale black, reduced; the mesial stripes on both wings interrupted, macular; the extra discal rounded spots on primaries minute, the sub-marginal crescents wanting, and represented by small clusters of scales at the summits only, leaving a clear space to the margin, which margin is edged by an even stripe; on secondaries the rounded spots are larger, and the crescents are represented by larger clusters of scales; the marginal border is extended on each nervule so as to encroach on and make narrow the clear space. Under side of primaries pale red-brown, uniform from base to margin; the black markings obsolescent or altogether wanting. Secondaries brown (without the red shade); across the disk a belt of same form as in *Chariclea* and *Helena*, a shade only lighter than the ground, and all of one hue (no white as in the allied species); the rounded spots and clusters of scales repeated faintly, and behind each of the latter a pale, undefined patch.

Female.—Same size. Brown, dusky, inclining to melanism, sometimes of a slaty hue rather than brown, and always with a peculiar smooth surface, suggestive of grease which had been removed by benzine; the markings pale, diffuse; the mesial stripe, on primaries, has become a broad band reaching from margin to margin, and the sub-marginal clusters of scales are merged in a continuous stripe; on secondaries, all the markings about base and on disk are obsolescent, the sub-marginal clusters are large and diffuse, and the margin is edged by a crenated band. Under side as in the male.

From one ♂ and two ♀ sent me by Mr. Thomas E. Bean, and taken at Laggan, Alberta. He writes: "This Argynnis, I think, occurs strictly above timber line, and not very near it either, though also not at the highest points of the mountains. In 1888, on one mountain, it was decidedly frequent, but in 1889, I saw not one. The females all present the same slightly shining surface, whether brown or slate in color, but it is not grease. The examples I sent you were not in the least greasy, nor

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are any that I have." (This was in direct reply to my question, suggested by Dr. Holland, who was confident they had been greased and cleaned.) "I do not notice this shiny surface especially in the males; they are all fulvous, and none show melanism. All the females tend to obscuration, and more than half are about as melanic as those sent you, one or two perhaps a little darker. Some few are clear enough for the fixed lines to show. This form does not at all frequent the same localities as *Chariclea*, which only occurs below timber, so far as I know."

Alberta is wholly unlike any member of the group known to me. It does not at all agree with *Chariclea*, var. *obscurata* McLachlan.

In the delicacy of its markings the male is nearer *Helena* than *Chariclea*, but these are interrupted and reduced. *Helena* is an alpine species, and found above timber line. But it retains at every elevation which it frequents the same features. The examples under view are larger than any *Helena*, and equal the largest *Chariclea*.

NOTES ON SIGALPHUS CURCULIONIS AND SIGALPHUS CANADENSIS.

BY C. P. GILLETTE, AMES, IOWA.

I reared from *Conotrachelus nenuphar* last summer a number of parasites, which were determined for me by Dr. Riley as *Sigalphus curculionis* Fitch, and *S. curculionis*, var. *rufus*. Full descriptions of both of these may be found on page 27 of Riley's Third Missouri Report, and upon page 67 of the Supplement to the Missouri Reports.

The variety *rufus* appeared much more abundant than *curculionis* in my breeding cages the past summer. These two forms differ so much from one another, and in some respects, especially in the number of joints of the antennæ, from Riley's descriptions, that I have made the following notes upon them:—

Three females of the dark form, bred by myself, and two males loaned me by Prof. Osborn, have the ocelli in every case, not touching, but distinctly separated. The two males have respectively 29 and 30 joints in the antennæ. Two of the females have 29 joints each, and one 28 joints in the antennæ. The largest female measures just .14, and the males

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measure a scant .13 of an inch in length. The ovipositor is exserted in one case .11, and in two cases .12 of an inch. Length of wing .14 of an inch; length of antennæ .125 of an inch. The breadth of the head, as compared to *rufus*, is as five to six.

In the eleven specimens of *rufus* now in my collection the ocelli are in every case distinctly separated. In five cases the antennæ are 32-jointed; in four cases they are 31-jointed, and in two cases they are 30-jointed. All are females, and in no case do they vary much from .15 of an inch in length. The shortest measurement of exserted ovipositor is .14, the average is .18, and the longest is .20 of an inch in length. The breadth of the abdomen, as compared to *curculionis*, is in the proportion of four to five. Length of wing .15 of an inch; length of antennæ .15 of an inch. *Rufus* is decidedly more robust and larger in every case than *curculionis*, and, were it not for the fact that so eminent an authority as Dr. Riley considered them the same species, I should think that *rufus* ought to be raised to the rank of a species.

Sigalphus canadensis.—Three specimens of *S. canadensis* were reared by me the past summer from the plum gouger *Anthonomus scutellatus (prunicida)*. How this little braconid can deposit her egg within the hard pit of the plum, I am unable to say. It can not be that it is deposited there before the pit becomes hard, for the larva of the gouger does not get entirely through the pit until the latter becomes very hard, and the parasite does not attack the larva of the gouger in time to prevent its complete development and pupation, as was found by cutting into the plums containing parasitized pupæ of *Anthonomus scutellatus*. When the larva of the gouger becomes full grown it gnaws a hole through the pit, out of which it can escape when it has changed to a beetle, and the parasite is dependent upon this provision of the larval gouger for its own escape. Possibly the parasite does not deposit the egg until the opening has been made in the pit; but, if this is the case, it must go through its transformations in a very short time. And how would the female know at what part of the plum to insert her ovipositor to strike the small opening in the pit? Although but three of these parasites were secured, it was not uncommon to find a plum with a small exit, such as is made by the mature parasite in escaping, and which is much too small for the exit of the gouger.

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 104, Volume xxii.)

Genus LEPTARCTIA Stretch.

1873—Stretch, Zygænidæ and Bombycidæ, 118.

Head small, hardly retracted; eyes inconspicuous, bulging; ocelli distinct; vestiture thin, loose and divergent; tongue weak and short, spiral; palpi weak, short, drooping, with thin divergent vestiture; legs sub-equal, posterior slightly the longest; middle and posterior tibiæ each with minute terminal spurs only. The thorax is short, stout, convex with thin hairy vestiture. The antennal joints of the female have the joints marked, scarcely serrate; in the male they are bipectinate. The primaries have 7 to 10 out of a long stalk from the end of the sub-costal, 6 from a short spur out of the same point; 3, 4 and 5 are nearly equi distant from the end of the median, and quite close together. On the secondaries 8 as usual, 6 and 7 from the end of the sub costal; 3, 4 and 5 rather close together from the end of the median. I had intended to give a review of Mr. Butler's work on this genus (1881, Ann. Mag., N. H., ser. 5, VIII., 312), but the excellent paper by Mr. French in the November-December, 1889, numbers of the CAN. ENT. has rendered this unnecessary, and I simply give the bibliography, using Mr. French's sequence of species or varieties. Whether in a genus like this, where no two specimens are alike, so many names are desirable is a question. Twice the number could be as justly applied. A large series of specimens is in the United States National Museum, one lot bred from eggs produced by a ♂ *stretchii* with a ♀ *lena*—the extremes of the series as arranged by Mr. French.

L. stretchii Butler.

1881—Butl., Ann. Mag. N. H., 5, VIII., 312, *Leptarctia.*
1889—French, CAN. ENT., XXI., 222, f. 12, *Leptarctia.*
♂ *dimidiata* Str.
1873—Stretch, Zyg. & Bomb., pl. V., f. 9, *Leptarctia.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 312, *typ. pr.*
Habitat—Oregon, So. California.

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L. boisduvalii Butler.

1881—Butler, Ann. Mag. N. H., 5, VIII, 313, *Leptarctia.*
1889—French, CAN. ENT., XXI., 222, f. 13, *Leptarctia.*
decia Stretch.
1873—Stretch, Zyg. & Bomb., pl. V., f. 15, *Leptarctia.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *typ. pr.*
Habitat—Oregon.

L. dimidiata Stretch.

1873—Stretch, Zyg. & Bomb., 123, ff. 7-10, *Leptarctia.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, restr. to f. 7 and 8.
1889—French, CAN. ENT., XXI., 222, f. 14, *Leptarctia.*
Habitat—Calif., Oregon, Colorado.

L. albifascia French.

1889—French, CAN. ENT., XXI., 232, f. 15, *Leptarctia.*
Habitat—California.

L. occidentalis French.

1889—French, CAN. ENT, XXI., 223, f. 16, *Leptarctia.*
Habitat—Northern California.

L. latifasciata Butler.

1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *Leptarctia.*
1889—French, CAN. ENT., XXI., 223, f. 17, *Leptarctia.*
Habitat—Oregon, So. California.

L. fulvofasciata Butler.

1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *Leptarctia.*
1889—French, CAN. ENT, XXI., 223, f. 17, *Leptarctia.*
lena Stretch.
1873—Stretch, Zyg. & Bomb., pl. 5, ff. 13-14, *Leptarctia.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *typ. pr.*
Habitat—Oregon, Truckee Calif.

L. californiæ Walker.

1855—Wlk., C. B. Mus. Lep., III., 625, *Nemeophila.*
1873—Stretch, Zyg. & Bomb., 240, = *lena.*
1881—Butler, Papilio, I., 130, *an sp. id. lena.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 312, *Leptarctia.*
1889—French, CAN. ENT., XXI., 223, ff. 18-19, *Leptarctia.*

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lena Bdv.
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 73, *Lithosia.*
1873—Stretch, Zyg. & Bomb., pl. V., ff. 11 and 16, *Leptarctia.*
adnata Bdv.
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 73, *Lithosia.*
1873—Stretch, Zyg. & Bomb., 120, *pr. syn.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *pr. syn.*
Habitat—Calif., Oregon.

L. wrightii French.
1889—French, CAN. ENT., XXI., 224, ff. 18-19, *Leptarctia.*

L. decia Bdv.
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 72, *Lithosia.*
1873—Stretch, Zyg. & Bomb., 121, pl. 5, ff. 1, 2 and 15; *Leptarctia.*
1878—Strecker, Proc. Dav. Ac. Sci., II., 273, *Leptarctia.*
1881—Butl., Ann. Mag. N. H., 5, VIII., 314, *Leptarctia.*
1889—French, CAN. ENT., XXI., 224, ff. 20, 21, *Leptarctia.*
Habitat—California, Oregon.

L. lena Bdv.
1869—Bdv., Lep. Cal. (Ann Soc. Ent., Belg., XII), 73, *Lithosia.*
1873—Stretch, Zyg. & Bomb, 120, 240, pl. V., ff. 3–6, 11–14, 16.
1881—Butler, Ann. Mag. N. H., 5, VIII., 314, restr. to ff. 3 and 5.
1889—French, CAN. ENT., XXI., 224, f. 22, *Leptarctia.*
Habitat—California, Oregon, Colorado.

This arrangement, giving each of the forms equal value, is of course not to be taken as indicating the specific distinctness of any. The indications are all that there is but a single species with a wide range of variation. It remains only to state that in Mr. French's paper he gives the life history of the species, describing all stages.

Genus KODIOSOMA Stretch.

1873—Zyg. & Bomb., 67.

This genus contains a series of forms of doubtful distinctness, none of which I have been enabled to study. The species seem excessively rare, and there are no specimens of the genus in the collection U. S. National Museum.

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K. eavesii Stretch.
1873—Stretch, Zyg. & Bomb., 69, pl. II., f. 6, *Kodiosoma.*
Habitat—Nevada.
K. fulva Stretch.
1873—Stretch, Zyg. & Bomb., 67, pl. 2, f. 7, *Kodiosoma.*
Habitat—California.
K. nigra Stretch.
1873—Stretch, Zyg. & Bomb., 68, pl. 2, f. 8, *Kodiosoma.*
Habitat—California.
K. tricolor Stretch.
1873—Stretch, Zyg. & Bomb., 68, pl. 2, f. 5, *Kodiosoma.*
Habitat—California.

Genus PHRAGMATOBIA Steph.

1830—Steph., Ill. Brit. Ent. Haust., II., 73.
1855—Wlk., C. B. Mus., Lep. Het., III., 628.
1862—Morris, Synopsis, 346.

Head small, retracted; tongue weak and short, palpi rudimentary. Vestiture woolly. Antennæ simple in both sexes. Legs weak and rather short; tibial spurs distinct and normal in number. The anterior and middle claws seem simple; posterior with a decided tooth at tip. The tarsi are very feebly spinulose.

Primaries with 7 to 10 out of a stalk from the end of subcostal; 7 and 10 from about the same point; 8 and 9 forking just before the apex; 3, 4 and 5 are about equi-distant from the end of the median.

Secondaries veins 6 and 7 together from end of subcostal, 8 from its middle; 3, 4 and 5 from the end of the median rather close together; 4 about twice as far from 3 as from 5.

P. assimilans Wlk.
1855—Wlk., C. B. Mus., Lep. Het., III., 630, *Phragmatobia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 536, *Phragmatobia.*
1862—Morris, Synopsis, Supplt., 346, *Phragmatobia.*
1863—Saund., Syn. Can. Arct., 23, *Phragmatobia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 122, =*rubricosa.*
1889—Slosson, Ent. Amer., V., 85, *an sp. dist. rubricosa.*
Habitat—New Hampshire.

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This species—if species it is—has languished among the synonyms, ever since Dr. Packard referred it there in 1864. A specimen taken in 1888 by Mrs. Slosson seems to justify its claim to recognition as a species, and it is so recognized here.

P. rubricosa Harris.

1841—Harris, Rept. Ins. Mass., 253, *Arctia.*

1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 49, *Arctia.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 541, =*Crocota rubicundaria.*

1862—Harris, Inj. Ins., 356, f. 171, *Arctia.*

1862—Morris, Synopsis Supplt., 341, *Arctia.*

1863—Saund., Syn. Can. Arct., 24, *Phragmatobia.*

1864—Pack., Proc. Ent. Soc., Phil., III., 122, *Phragmatobia.*

1883—Edw.*, Papilio, III., 127, *Phragmatobia.*

1887—Edw.*, Ent. Amer., III., 168, *Phragmatobia.*

fuliginosa ‡ Auct.

1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 40, *Arctia.*

1855—Wlk., C. B. Mus., Lep. Het., III., 628, *Phragmatobia.*

1860—Clem., Proc. Acad. Nat. Sci., Phil., XII., 539, *Phragmatobia.*

1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, *pr. syn.*

Habitat—Mass., New York, Maine, California, Canada.

It is not admitted by some of our old collectors that *rubricosa* refers to a form really distinct from the European *fuliginosa.* Superficially they undoubtedly resemble each other very closely; but how nearly they will agree when closely compared is another question.

P. dubia Wlk.

1856—Wlk., C. B. Mus., Lep., Het., III., 682, *Cycnia.*

1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 72, *Phragmatobia.*

Habitat—H. B. Terr.

This species has dropped out of our list; but I cannot find that it has been referred as a synonym anywhere. Messrs. Grote and Robinson in their notes (supr. cit.) say: "Wings semitranslucent, brown or mouse color; veins on both wings whitish above; eyes margined narrowly with white; legs shaded with whitish outwardly; abdomen (greasy in the specimen) with three rows of brown spots." There should be no difficulty in identifying this species should it turn up.

(To be continued.)

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FOOD PLANT OF MELITÆA TAYLORI, EDW.

Having been asked by Mr. Jas. Fletcher, of Ottawa, to look for the larva of *M. Taylori*, with the purpose of discovering its food plant, &c., it was with much pleasure that I accepted the commission, and now have the gratification to inform you of my success.

I began searching on March 10th, but found everything very backward, owing to the severe winter experienced on this island. Being determined, however, not to miss an opportunity of succeeding, I continued making a close examination of the declivities of the coast at Beacon Hill (thinking it probable that the larvæ had not reached the top of the bluff before hibernating); but after several attempts to locate it, I turned my attention on March 30th to the level land above the cliff, and was rewarded by finding it feeding in numbers on the Rib-wort Plantain *(Plantago lanceolata, L.)*

One peculiar fact I must mention of *M. Taylori* is that the larvæ evidently avoided the old plants, and fed solely on the younger ones, instinctively knowing, perhaps, that they would be less exposed to the attacks of their natural enemies, as the young plants were mostly hidden by the dead grass of last year's growth; however, when the first was found it was an easy matter to follow them up, with the result of capturing about two dozen in half an hour.

They varied considerably in size, some being 6 lines, while most of them were 10 lines in length. I found a cast-off skin showing that they had moulted since "feeding up" this spring; and also that had I looked in the right place a few days sooner I should, without a doubt, have found them. They generally feed singly, but as their food plant grows in large patches it was possible to collect a dozen or more without changing one's position.

They occur all along the coast immediately fronting Beacon Hill, and I have found them a mile away from where they were plentiful; but, in that case, they were very few and far between, although I have collected several dozen during the few hours I could spare from business. They are day feeders, and naturally very slow in their movements.

The following table gives dates of capture with result:—

March 30 took 23 in ½ hour.
" 31 " 37 " 1 "
April 2 " 25 " 1 "

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April 6 took 11 in 2 hours.
" 11 & 12—heavy snow storm.
" 14 took 5 in 1 hour.
" 17 " 1 " 1 "

The larvæ are doing well in the breeding cage, and at some future time I shall be glad to submit my observations as to habits while in captivity. Meanwhile am pleased to contribute the above facts.

W. H. DANBY, 57 Government Street, Victoria, B. C.

ARGIOPE RIPARIA AND ITS PARASITE ICHNEUMON ARANEARUM, AND ITS PARASITE A CHALCID FLY.

BY FREDERICK CLARKSON, NEW YORK.

The nests of *Argiope riparia* were unusually abundant last autumn in the neighborhood of this city. During the preceding summer this gayly colored, but atrocious looking spider, could be seen stationed in the centre of its well formed geometric web on nearly all of the low shrubbery in the uncultivated portion of Central Park. Merciless to every insect caught in her web, her household is nevertheless oftentimes greatly reduced, if not altogether destroyed by *Ichneumon aranearum*, a fearless and victorious enemy. Among a large number of nests collected last autumn, those obtained in the latter part of September and as late as the 10th of October contained ova: a single cocoon possessing by actual count 1,277 eggs; those found later in October, and as late as November 3rd, contained young spiders. Only a few of those collected in October had suffered parasitic attack, but the greater number of such as were gathered later in the autumn, contained the larvæ of *Ichneumon aranearum* feeding upon the spiders, or else spun up in their cocoons sometimes to the number of forty. May we not infer from these facts that the parasite deposits her eggs in the nest of Argiope after the eggs of the latter have hatched, or at least, whatever may be the time of depositure, the larva of the parasite feeds upon the spiders?

In examining the cocoons of this Ichneumon an interesting exhibit of secondary parasitism was revealed. In several of the nests of Argiope containing each some thirty cocoons of the Ichneumon, I found that each larval inhabitant was being devoured by from eight to ten larvæ of a Chalcid fly.

"Great fleas and little fleas have smaller fleas to bite 'em,
The smaller fleas have lesser fleas, so on ad infinitum."

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CASES OF LONG PUPAL PERIODS AMONG LEPIDOPTERA.

BY R. R. ROWLEY, CURRYVILLE, MO.

In May, 1888, I received from Mr. W. H. Edwards, of Coalburgh, two larvæ of *Anthocharis genutia* which were feeding on pepper grass. On the 22nd (May), both larvæ pupated, having suspended two days before.

As the imagoes did not appear in a reasonable length of time, I communicated the fact to Mr. Edwards, and he informed me they would remain chrysalids till the next May. The summer of 1889 came and went and still my little *Genutia* pupæ slept on and entered upon the second year of their fast. I then learned of the tendency in the genus *Anthocharis* to remain two years in the chrysalis state.

The pupæ were kept through the past two winters in a closet adjoining a warm room, and the first imago, a beautiful male, appeared March 7th, 1890, the other, a female, five days later (12th), after a pupal period of nearly twenty-two months.

In a recent letter from Mr. Edwards, I was informed that the Californian species of *Anthocharis* often remain two years as chrysalids, but he does not state that he has ever known a *Genutia* pupa to go so long.

Another case.—On the 13th of February, 1888, I received four cocoons of *Callosamia angulifera* from Miss E. L. Morton, of Newburgh, N. Y. These cocoons were spun in the mid-summer of 1887. Three of them produced imagoes the following May, but the fourth remained over till the 19th of the next April (1889), having passed twenty-one or twenty-two months in the pupal state. I have had pupæ of *Triptogon modesta*, *Philampelus pandorus*, *Citheronia regalis* and *Eacles imperialis* to fail to give imagoes in the spring, living through the summer, and lingering even till early autumn before death overtook them, but never knew one to survive till the second summer.

NOTES.

A RARE BUTTERFLY.—We learn from the Ottawa Naturalist that five specimens of *Erebia discoidalis* Kirby, one of the rarest in the Canadian fauna, were taken by Mr. John D. Evans, at Sudbury, Ontario, on the 12th May last. The perfect insect is figured and described in Edwards "Butterflies of North America," 3rd Series, Part VII.

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TWO INTERESTING MONSTROSITIES.

BY W. HAGUE HARRINGTON, OTTAWA.

Many minor malformations of wings, elytra, etc., have been observed in examining insects, but recently I have met with two monstrosities which seem worthy of record. The first insect is a ♀ *Fænus tarsitorius* Say., given to me by my friend, Mr. Guignard, and captured by him on 24th June, 1885. In this specimen the left posterior tibia becomes trifid about one-fourth of its length from the base, the side branches diverging at an angle of about 30°. The three portions are symmetrical, of nearly equal size (but slightly smaller than the tibia of the opposite leg), and bearing the terminal spurs, etc. The three tarsi issuing from them are perfect in every particular of size and colour. The femur is swollen and gives an impression of three agglutinated, while the trochanter and coxa are also enlarged.

The second specimen was noticed a few days ago while I was putting sex labels on some Carabidæ, and is a ♀ *Pterostichus lucublandus* Say. In this insect only the last joint of the left middle tarsus is in triplicate, and while the parts are equal in size to one another, they are individually under the normal size. The fourth joint is widened (like three small ones joined laterally), while the remaining articles are somewhat shortened and thickened. The tibia is also slightly modified; the spines being irregular, and one of the terminal spurs flattened and bifid.

CORRESPONDENCE.

HEPIALUS QUADRIGUTTATUS.

Dear Sir: In a letter to me, dated October 7, 1864, the late Mr. Francis Walker wrote as follows: "Your *quadriguttatus* is, as you suppose, identical with my *H. argenteomaculatus* var." I have myself no doubt that these two Hepiali are distinct species. In Agassiz's Lake Superior, Harris gives *quadriguttatus* as the same as the eastern *argenteomaculatus*, which latter Mr. Mead took in the Catskills, N. Y.

A. R. GROTE, Bremen, Germany.

Mailed June 4th.

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APHIDIUS GRANARIAPHIS, N. SP.

BY PROF. A. J. COOK, AGRICULTURAL COLLEGE, MICHIGAN.

Black above, yellowish brown beneath. The antennæ are black, the front, mouth parts and legs yellowish brown. Rarely the femora and tarsi are dusky, and the ventral surface quite dark. Very rarely the dorsal surface is brownish, except the pedicel and tip. The occiput or collar is brown. The antennæ are sixteen jointed in the female, and seventeen in the male, and are cylindrical, recurved, and thickly set with short, light colored hairs. The first two joints are shorter and larger than the others; the succeeding joints are cylindrical, close together, and equal in length, except the last, which is longer and conical. The abdomen is lanceolate, and all the segments are freely moveable on each other, so it can be easily bent under the thorax. The venation of the wings—see figure—is simple, and the first discoidal cell incomplete. We know from the simple venation of the wings that this is a Braconid. It belongs to the genus Aphidius, as the first discoidal cell is incomplete, the abdomen lanceolate, the antennæ sixteen or seventeen-jointed, and the ventral valves in the female simple. It is 2½ mm. (1-10 in.) long.

Fig. 3.

This species differs from *Aphidius avenaphis* Fitch, as that species has nineteen or twenty joints to the antennæ, is honey yellow where this is brown, and the first two joints of the antennæ, the pedicel of the abdomen, and a spot on the suture between the first and second joints of the abdomen are honey yellow and not black as in Granariaphis. The joints of the antennæ are also less pedicelated, or closer together than in the Avenaphis.

This species is interesting from the fact that it was the principal agent in exterminating the countless millions of grain Aphides last season—1889—in Michigan and adjacent States. While Aphidius avenaphis and other enemies, like Syrphus flies, Coccinnelids and Chrysopa fly larvæ were

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numerous and very active. Yet, by far the greater part of the louse destruction here was accomplished by this new species—Aphidius granariaphis. June 30th.—The heads of wheat were thronged with healthy vigorous lice, with but few of the light colored rounded parasitized lice—see figures. Ten days later the lice were nearly gone, and the parasitized ones were largely in the majority. Rapidly as the lice increase, they seem to be no match in this respect for the parasites.

Fig. 4.

Fig. 5.

I think the grain lice Aphis (Siphonaphora) avenæ destroyed at least one-third of the wheat crop of Michigan last year, and greatly injured the balance of the crop. Had it not been for these parasites we should have had, I think, no crop at all.

THE BUTTERFLIES OF LAGGAN, N. W. T.; ACCOUNT OF CERTAIN SPECIES INHABITING THE ROCKY MOUNTAINS IN LATITUDE 51° 25′.

BY THOMAS E. BEAN, LAGGAN, ALBERTA.

(Continued from page 99.)

DEFINITE MARKS OF THE ♀.—Observation of 62 caught specimens enables me to supplement, in some degree, Mr. Strecker's description. The smallest measures 46 mm., equal to 1.8 inch. The largest is 58.5 mm., or 2.3 inches. The average expanse of the 62 is 52.5 mm., or 2.07 inches. The cell spot above primary is larger than in the males, and has never that semi-obsolete appearance which it presents in some of the males; it varies from a small but definite spot of .5 mm. in diameter to a spot of 1.5 mm., is usually sub-rotund, sometimes sub-linear, and is frequently centered with yellow in moderate degree. On under side hind wing the dark nucleus or "patch" of costa is lacking in all, and the submarginal series of dark spots beneath both wings is found to be plainly presented only in three specimens, with slight traces in fifteen others. *Elis* ♀ varies greatly as to condition of border above primary; a few of my specimens have a completed dark border, much as in an average *Hecla*, with the yellow spots small and entirely enclosed. These, however, are extreme instances. At the opposite extreme are specimens

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with only the outer side of the border formed, the inner side lacking, but with the row of yellow spots tolerably conspicuous in contrast to the orange ground of the disk. Between these two extremes occur numerous intermediate degrees. The most qualitative distinction of the fore-wing border is that the yellow spots are in general nearly of equal size in the same individual, and especially that the spot at anterior median interspace is usually almost as large as the others; this is the spot which in most forms of *Colias* is usually much smaller than the adjoining spots, and which tends to become obsolete in proportion as the border is more completely developed.

The special type of ♀ Mr. Strecker drew his description from, with seven yellow spots in fore-wing border, is not the more common variation. Usually the two spots near apex are obsolete; an occasional specimen, however, with all the seven spots neatly defined, attests the accuracy of the printed description.

Mr. Strecker also describes an "Albinous ♀ form" of *Elis*, stating that about six of the albinous and nine of the orange form were taken by Capt. Geddes. This proportion of six albino to nine orange, indicates that the "albinous ♀" was based on an error of identification. In the course of several summers' collecting, and also in breeding *Elis* pretty freely from the egg, nothing resembling an albino has been found, while I have seen *ninety* orange ♀s. The ♀ of another species must have been mistaken by Mr. Strecker for a white form of *Elis*. In the district occupied by *Elis* occurs a *colias* rather less frequent, the ♀ usually nearly white, but with a variety still more rare which is a bright clear yellow. It seems likely this white *Colias*, about size of a small *Elis*, may have been the original of the supposed "white *Elis*." The status of this form is somewhat in doubt. It is near to *Pelidne* and *Scudderi*, as its ♂ sufficiently demonstrates, and of course not specially close to *Elis;* its ♀, however, has some resemblance to *Elis* ♀.

One important character of *Elis* remains to be mentioned, which is, that the ♂ is characterized by the presence of the so-called "glandular space" on upper surface of hind wing on costa near base of wing. This structure appears, under moderate enlargement, as a dense cluster of much tilted scales of special form. Its function (if it has one) is probably mechanical rather than physiological. So far as the *Colias* forms are concerned, it is found especially, if not exclusively, in the higher forms, and

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wanting in the more primitive, being apparently a modern improvement adapted to some purpose of mechanical utility and developed only at an advanced stage of Coliad progress. Perchance 'tis a refinement in the mechanism of flight, or mayhap some new sort of musical implement, dispensing ultimate atoms of harmony inaccessible to our coarse sense as the "music of the spheres." Of the North American forms of *Colias* only three beside *Elis* are possessed of this peculiar apparatus. These are *Meadii*, *Cæsonia* and *Eurydice*, and the possession of this character brings them into very good society indeed, comprising such fine species as *Lesbia*, *Aurora*, *Vautieri*, *Fieldii* and *Electra*, in all of which I have examined this structure, as also in *Edusa* and *Myrmidone*. In *Elis* it appears in all the males I have obtained, whether bred or caught. This "glandular space" is not peculiar to *Colias*. I have noticed it in several species of *Catopsilia*, among them *Rurina*, *Trite* and *Pyranthe*. In *Gonopteryx clorinde* ♂ the structure is well developed, being in the specimen I examined 17 mm. long, and 2 mm. broad in the middle; the colour pale brown. In *Colias elis* the "glandular space" varies from a pale—slightly greenish—yellow to a bright orange.

The foregoing parts of this description, relating to the size and proportions of the butterfly, the breadth of the dark borders, and the size of the several spots and marks on the wings, have been taken from captured butterflies, because bred specimens seldom present the natural averages, but instead exhibit differentiations constituting either type retardation or race progress resulting from and proportioned to the conditions under which they are reared; conditions usually diverse from those of nature. It will not be necessary to adhere to this discrimination in describing the colors and the minute details, and these can more profitably be derived from observation of the bred specimens, where they are displayed in a perfection almost impossible to find intact in flown specimens.

The material of *Elis* bred during three seasons, 1887 to 1889 inclusive, consists of three families *ex ovo*, and four butterflies matured from larvæ found wild—altogether 37 ♂ and 28♀, not to mention a lot of parasites from one of the estray larvæ. These bred specimens mostly show a departure from the average type developed under ordinary out-of-doors conditions. In general this diversion is a progress, an advance of type, a presentation of the ideal instead of the practical *Elis*. In natural conditions *Elis* is subject to somewhat severe limitations. The caterpillar

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issues from the egg early in August in average seasons, and its term of hibernation, beginning soon after the middle of August, continues until approximately the beginning of May, so that ordinarily hibernation lasts somewhat more than eight months. Emerging from its winter shelter early in May, the juvenile larva re-enters active life, still a literal infant though over eight months old*.

So chilly are the May nights, and many of its days also, that more than half this active period of the larva must be passed in a state scarcely different from actual hybernation. The conditions of life are doubtless somewhat restrictive, and a removal of these disabilities, by rearing the caterpillars in a warm house, is like an introduction into the tropics.

The result of this culture in an improved climate, other circumstances being favorable, is a notable progress of type, an outcome of butterflies definitely in advance of the ordinary averages.

One of the bred families illustrates well this immediate improvement of type. This lot comprises nine ♂s and ten ♀s, and is a natural family from eggs of one ♀. The increased size of these specimens, as compared with the caught lot, is decisive. The twenty-nine caught ♂s average 51 1-5 mm.; the nine ♂s of this family show an average expanse of 53⅔ mm. Only one of the ♂s of this family expands less than the average of the caught ♂s, each of the remaining eight exceeding that average. The ten ♀s average 57½ mm., against 52½ mm., as the average measure of the 62 caught ♀s; indeed, each of the ten ♀s of this brood is decidedly beyond the average of the caught ♀s, none being under 55½ mm. One of the ♀s, measuring sixty mm., is slightly over 2.36 inches, is the largest *Elis* in my series. These nineteen specimens are as much superior to the caught material, in average of pattern elaboration, as in size. At a first general view they might almost suggest the idea of a distinct species, so superior are they as a body to the general mass of the caught set. But the difference would become intelligible to any careful observer, on inspection, as a simple advance of one set beyond the average development of the other; a difference in degree, not a change in method. This distinction between quantitative and qualitative differences is the vital point in

* I hope none of my younger readers entertain the absurd mediæval superstition that hibernating caterpillars pass the winter in a *frozen condition*. In successful hibernation they do not get near to such a condition; but if they do absolutely freeze, then are they undone caterpillars. Valkyria gives them sleep, unmixed with dreams, and they wake in Valhalla.

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estimating the status of closely related forms. With fully representative material of any two forms to compare, the pattern on the wings tells the story, if the observer can read in the butterfly alphabet. The errors of interpretation come chiefly from the primary fault of mistaking a contrast between less and more for a diversity of like from unlike, or the reverse. In frequent comparisons of *Elis* and *Meadii*, my chief effort has been to ascertain the nature of the difference between them, and my resulting impression is that *Elis* is a valid species, near as it is to *Meadii*. I do not find an overlap of closely similar specimens uniting them, and the two forms appear to have a somewhat diverse plan of pattern, a somewhat dissimilar method of variation, indicating that they are travelling different roads. They are, I take it, already a little different in kind, not merely in degree. In comparing the nineteen *Elis* of the family above mentioned, with the set of caught *Elis*, however, the difference is one which need not be misread, even were the circumstances of origin unknown. It is a difference large in amount, but not signifying alienation. The overlap between the two series consists chiefly of a small proportion of males; several of the most finely developed of the caught set being about of the same rank as several of the least developed males in the bred family. Among all the caught females only one compares in size and fine development with the average of the ten females of this family. Evidently, in this signal advance in race character, the females showed more tendency to depart from type than the males. All the females in this family except one, and more than half the males, far surpass the average of caught set as to breadth of dark borders, and it is a genuine progress, entirely free from that erratic over-development of dark markings often occurring in bred specimens; in these specimens the effect is completely harmonious and symmetrical. In this family there are two colors, both of males and females. Four of the males are yellow-orange, the other five bright red-orange, one of them very fiery orange. Eight females are of the red shade, several being almost of as intense a shade as the most brilliant male; the remaining two are yellow, not so clear and light as the yellow-orange males, but slightly tinged with ochre. The reddest males and females are unlike any *Meadii* in my collection; clearer red than any, and lacking the burned-brick tinge of one very red female *Meadii*. Only two, both females, of the caught *Elis*, are quite of this pure red-orange hue. The caught *Elis* do not specially differ from *Meadii* in the color of disk above primary, and are in general somewhat tinged with ochre; one female is

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unique in color, being greenish-yellow, but is not otherwise variant from usual form.

Another family consisting of twenty-five ♂s and thirteen ♀s, from eggs laid by one female, scarcely, if at all, surpasses the averages of the caught material as to expanse. The twenty-five ♂s show an average of only 50½ mm., while the caught males average 51 1-5 mm. The thirteen ♀s average slightly larger than the caught females, 53 mm. against 52½ mm. As to pattern, the females present a rather more perfected type than the out-door average, but the males are scarcely equal to the natural average.

The relation found in these two bred families between the numerical proportion of the sexes and the degree of type development, lends some support to the hypothesis that favorable conditions during larval growth tend to a greater production of females, while less favorable conditions produce an increased outcome of males. The proportion of males to females in these two broods is in great contrast. The brood which shows such improved averages contains slightly more than an even share of females; and the family averaging scarcely up to nature's mean level contains a large overplus of males.

Additional to the direct evidence derived from inspection of the butterfly, there are several circumstances which add somewhat to the probability that *Elis* is a good species. Of some little weight, perhaps, is the argument from geographical distribution, that so far as known there is a great gap of country between the district of the form *Elis*, and the territory in which dwells *Meadii* proper. Should later discovery be made of *Elis* considerably further south, or of *Meadii* much more to the north than at present known, the probability of their distinctness would be somewhat lessened. Another and better argument is the inference from relative altitude. *Meadii* is normally an alpine butterfly, *Elis* is subalpine. All accounts agree that *Meadii* lives above timber, though like other alpine habitants, it may in peculiar circumstances make excursions to a lower level. Just such an incident may have originated *Elis*. One needs not an india-rubber imagination to suppose that somewhere in its mountain line of territory, under specially favoring conditions, *Meadii* may have established a colony below timber line. That accomplished, and the feeble colony proving able to maintain itself in the changed conditions, all the elements of the case would combine to speedily separate the new from the old, in kind. Perhaps hardly in any other way could

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a distinct species be so rapidly evolved. The ties between the old and the new forms would either be immediately and permanently sundered, or at least greatly enfeebled, as the only means by which these ties of consanguinity could be preserved would be in recurrence of such unusual incursions as that by which the colony had at first been established. The direct influence of the new conditions would be especially effective in producing modification, because the change of conditions would be an unusually great one. However, this is but conjecture. As facts, we know that *Meadii* lives above timber, and *Elis*, at a great distance to the north, below timber; and that they differ, although not broadly. They are not known to live next door to each other, anywhere. The geographical relations of *Elis* to *Meadii* may prove more interesting and important than the question as to the exact biological ties. Should the name of *Elis* prove to be "Dennis," it is but one more skeleton to stand upon end with the rest of the weird monuments up on Synonym Mountain; but, in either event, one would like to know just why *Elis* and *Meadii* live at different relative altitudes.

The nature of the difference in the imago between *Elis* and *Meadii* is the chief reason for considering them distinct. At first sight, I did not expect *Elis* would prove distinct from *Meadii*. After obtaining gradually an ample material of *Elis*, and becoming quite familiar with its mode of variation, such differences between *Elis* and *Meadii* became evident, that I was obliged to consider the two forms as probably distinct. By the kindness of Mr. David Bruce, I have lately obtained an additional fine series of *Meadii*, and after repeated comparisons find my previous impression strengthened. I suppose that a new species of butterfly may be considered inaugurated, so soon as a varying form has acquired a visible diversity in the method of its biological progress, as compared with the method of the proximate species; and that our earliest recognition of this acquired diversity will be by observation of a correlant diversity in the method of the color-pattern of a representative series of the new species, as compared with the method of the proximate species. I think *Elis* has reached this point and that it is a valid species.

Meadii, as such, does not occur at Laggan. My set of six male and eleven female *Meadii* compare with the caught *Elis*, in average size, as follows: *Meadii*, males 47¾ mm., females 48 5-7 mm.; caught *Elis*, males 51 1-5 mm., females 52½ mm.; "fair count and no favour."

ERRATUM.—Page 96, lines 1 and 2, "Mount Temple about eight miles south-west"—for "south-west" read "south-east."

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SOME NEW MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Crocota Rosa, nov. spec.

Expanse .80 of an inch.

Upper surface of fore wings, thorax, collar, upper and front of head and terminal joint of palpi pale yellow-brown or fawn color, the only trace of a discal dot is a little duskiness at the end of the cell. Hind wings red, pale, a little dusky, somewhat rosy tinted. Abdomen concolorous with the hind wings; fringes concolorous with the wings.

Beneath, hind wings concolorous with the upper surface; fore wings more red, uniformly so except that the costa is ochre; legs dusky; abdomen as above, without marks of any kind; under side of palpi yellowish red; eyes black.

One example from Texas and one from Ohio.

This species is close to *Rubicundaria* but lacks the black terminal border to the hind wings and the black marks on the abdomen. Besides this the fore wings are a little narrower.

Hemaris Brucei, nov. spec.

Expanse 1.55 inches.

Top of head, thorax and basal two joints of abdomen, olive, not very dark, the shoulder tufts yellowish, only a little lighter than the adjacent parts; the third joint black, with the lateral hairs bright pale yellow, the lateral tufts of one and two the same color, and a faint line of the same on the posterior margin of these joints for a short distance above the tufts; joints 4, 5 and 6 bright pale yellow, the last one slightly rusty, the lateral tufts the same; the terminal joint with its tufts, both lateral and central, jet black. Palpi beneath very pale yellow, almost white, above blackish, only a few black hairs laterally; eyes with a circle of white hairs; body beneath black but sparsely covered with yellow hairs, except the terminal joint where the hairs are black. Wings as in the Senta group, the terminal and costal borders dark brown, narrow, somewhat dentate on the inner edge, the most so near posterior angle; the outer two-thirds of the basal patch dark red, a small red apical patch that does not reach the apex, a few olive hairs at the base. Hind wings with the margins dark brown, the inner one sparsely overlaid with olive, a red anal patch. Under side of fore wings with the borders about the same shade as above, the basal portion overlaid with pale yellow, the same scattered well over the costa,

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a mere trace of the red on the basal patch, the apical red patch as above. Hind wings with the basal-internal patch overlaid with pale yellow the same as the fore wings, two red stains, one at the anal angle and the other toward the base, the outer border with a slight red tinge, but no more so than above. Antennæ black.

One male from Colorado, collected by David Bruce, and dedicated to him in the name.

Platycerura Gigantea, nov. spec.

Expanse of wings 2.25 inches.

Head, thorax and abdomen rather dark gray, much darker than its ally *Furcilla*, the head and collar with a mixture of brown scales, the abdomen also mixed with brown, except the lateral semi-tufts and the terminal joint. The fore wings with a basal half line and three transverse lines as in *Furcilla*, the second representing the transverse shade of the Noctuidæ, all black; the t. a. line is not quite so much angled on median vein as on *Furcilla*, the line broader; the shade line or second a little more wavy, curving outward on median vein and outward again on submedian, not touching the t. p. line but more separated from it than in *Furcilla;* reniform a black slightly curved mark, shaded a little outwardly; t. p. line takes the same course as in its ally, but not bent inward quite so much below the cell, bordered externally with a very slight pale shade; s. t. line a very faint pale shade taking the same course as in *Furcilla*, and scarcely noticeable only for the slight internal shading of darker gray, this shading more prominent in its anterior third. The wing is almost a uniform gray, except the black transverse lines. Hind wings sordid white, the veins and the internal margin smoky, the costal margin sprinkled with dark scales. Fringes gray, checkered at the end of the veins, the fore wings only faintly so. Under side pale gray, the transverse lines of the fore wings subobsolete, only distinct as black spots on the costa, but the t. a. line and the shading in connection with the s. t. line crossing the wing; hind wings with two black shades extending backward from the costa and a discal spot, the latter showing faintly above. Body below concolorous with the wings. The palpi are short like those of *Furcilla*, the terminal joint blackish; the antennæ with the shaft gray above, the pectinations and all parts below ochre.

One male from Colorado, received from David Bruce. He writes me that he took a half-dozen examples at light. In size this is more nearly

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that of a female that I have from Texas that I have called *Furcilla*, but which may possibly be the female of this species. This example expands a little over two inches, the fore wings are a little lighter than the one from Colorado described above, and the t. p. line and the median shade line are united. The hind wings of the Texas specimens are darker than the Colorado, and the fringe of the hind wings is white.

ON THE LISTS OF COLEOPTERA PUBLISHED BY THE GEOLOGICAL SURVEY OF CANADA, 1842–1888.

BY W. HAGUE HARRINGTON, OTTAWA.

During nearly fifty years the Geological Survey of Canada has been engaged in exploration, and since Confederation it has had practically an unlimited field for its operations. The investigation of the fauna and flora of the Dominion, and the formation of a museum of natural history, are included in the plan of its present organization, but its equipment has hitherto permitted but a partial accomplishment of these departments of its work. Geological investigations and collections have largely absorbed the members of the staff, and systematic work outside of these has been chiefly in ethnology, botany and ornithology. In the museum, entomology is as yet represented but poorly, the only order in which there is a creditable collection being the Lepidoptera, of which the diurnals are well shown by the collection purchased from Capt. Geddes. Any collections made by the officers of the Survey have been in addition to their daily duties, and have been, in consequence, neither very numerous or extensive.

The lists of Coleoptera, which are thinly scattered through the Reports of Progress, have, however, a considerable value as having been made in many instances in remote districts, and before the influx of settlers; thereby giving mostly species indigenous to the various localities, and offering good records for the study of distribution. The fact, also, that all but three short recent lists were furnished by LeConte, renders the determinations of additional value and interest.

As the publications of the Survey are inaccessible to very many entomologists, and as their cost, even when obtainable, prevents their purchase merely for the few entomological lists they contain, it is thought that a reproduction in the CANADIAN ENTOMOLOGIST will be appreciated by its readers.

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The lists of LeConte's determinations have been collated so as to present a complete catalogue of the species and show the localities where each occurred. The omission of the names of describers (except in lists A. O., L'O., St. L. and N. C.), and occasional clerical or typographical errors have made the identification of some species difficult, and in a few instances so doubtful that they have been allowed to remain as in the original, and will appear in italics in the catalogue. The list of the British Columbia species was especially puzzling in this respect.

The catalogue, collated from the twenty lists which follow, contains 900 references to 469 species (including about a dozen varieties or races), which belong to 216 genera of 40 families. Of these references 300, or exactly one-third, are to 137 species of *Cicindelidæ* and *Carabidæ*, while many of the other species in the catalogue are such as one might expect to be found by collectors whose attention would be largely directed to the ground. The following are the lists which have been collated:—

Report of Progress, 1858, pp. 233–237 and 247–249.

A.O.—Catalogue of Coleoptera, collected by Mr. D'Urban, in the Counties of Argenteuil and Ottawa, in 1858, (99 species named, and following not determined *Gyrinus*, *Dineutes*, *Homalota*, *Tachyporus*, *Philonthus*, *Stenus*, *Epuræa*, *Cis*, *Cistela*, *Nyctobates*, *Apion*, *Tomicus*).

L'O.—List of Coleoptera from L'Original and Grenville, collected by Mr. R. Bell, (34 species).

St. L.—List of Coleoptera, collected by Mr. R. Bell, on the south-east side of the St. Lawrence, from Quebec to Gaspé, and in the Counties of Rimouski, Gaspé and Bonaventure, (69 species, besides *Brachinus*, *Aphodius*, *Tomicus* and *Galeruca*).

Report of Progress, 1875–76, pp. 107–109.

B.C.—List of Coleoptera, collected during the expedition of Mr. Selwyn to British Columbia in 1875, (146 species, besides *Elaphrus*, "probably n. sp., unless described from *Siberia*," *Hydnobius*, *Boletobius*, *Philonthus*, *Melöe*, *Sitones* and undetermined genera). Collection placed in museum of the Natural History Society of Montreal.

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Report of Progress, 1878–79, pp. 65, 66c.

N. C.—List of Coleoptera collected by Dr. R. Bell, in 1879, on the Nelson and Churchill Rivers, (37 species and *Gyrinus*).

Report of Progress, 1879–80, pp. 70, 74c.

List of Coleoptera collected in 1880 in Manitoba, and between Lake Winnipeg and Hudson's Bay, (by Dr. R. Bell, in four localities).

Y. F.—York Factory, Hudson's Bay, August and September, (24 species, also *Amara*, *Hydroporus*, "near *Schönherri* of Europe," and *Graphoderes* "to be described by Dr. Sharp").

N. O.—Norway House to Oxford House, July, (39 species, *Anisotoma* and *Graptodera*).

W.—Lower Fort Garry, Manitoba, June and July, (38 species).

C. L.—Cross Lake, Nelson River, July, (35 species and *Amara*).

Report of Progress, 1880–81–82, pp. 29, 39c.

List of Coleoptera collected in 1881 by Dr. Bell and others in the Lake Superior district, and in the Northwest Territories, east of 112th meridian and south of the 60th parallel.

The species given in Lists I. to VII. were collected by Dr. Bell; those in VIII. by Mr. William Isbister, and those in IX.–XI. by Mr. A. S. Cochrane.

S. M.—I. Sault Ste. Marie, between Lakes Huron and Superior, Lat. 46° 31′, Long. 84° 20′, (96 species).

M.—II. Mouth of Michipicoten River, Lake Superior, Lat. 47° 56′, Long. 84° 51′, (9 species).

H. M.—III. Head Waters of the Michipicoten River, Lake Superior, Lat. 48° 30′, Long. 84° 00′, to Lat. 48° 30′, Long. 84° 10′, (28 species).

M. F.—IV. From Missinaibi House, north-east of Lake Superior to Flying Post, Lat. 48° 29′, Long. 83° 35′, to Lat. 48° 02′, Long. 82° 20′, (18 species and two *Graptodera*).

O. K.—V. Oba and Kabinakagami Lakes and Rivers, north-east of Lake Superior, Lat. 48° 30′, Long. 84° 27′, to Lat. 49° 45′, Long. 83° 45′, (43 species).

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T. L.—VI. From Thunder Bay to Lake-of-the-Woods, west of Lake Superior, Lat. 48° 25′, Long. 89° 10′, to Lat. 49° 25′, Long. 95° 00′, (23 species).

O.—VII. Oxford House, between Lake Winnipeg and Hudson's Bay, Lat. 54° 53′, Long. 95° 44′, (67 species and *Cryptophagus* and *Graptodera*).

N.—VIII. Nelson River House, near Churchill River, Lat. 55° 50′, Long. 99° 30′, (51 species).

C. C.—IX. From Cross Lake, on the Nelson River, to Cumberland House, on the Saskatchewan, Lat. 54° 40′, Long. 98° 00′, to Lat. 54° 00′, Long. 102° 22′, (19 species).

C. R.—X. From Cumberland House to Reindeer Lake, Lat. 54° 00′, Long. 102° 22′, to Lat. 58° 30′, Long. 101° 00′, (19 species).

R. A.—XI. From the north end of Reindeer Lake to the west end of Athabasca Lake, Lat. 58° 30′, Long. 101° 00′, to Lat. 58° 30′, Long. 101° 00′, (Long. 111° 00′ ? 8 species).

Catalogue of the Coleoptera determined for the Geological Survey of Canada by Dr. J. L. LeConte :—

CICINDELIDÆ.

Cicindela longilabris *Say*. A.O., St. L., B.C., S.M., M.
purpurea *Oliv*. S.M., T.L.
var. 10-notata *Say*. B.C.
vulgaris *Say*. A.O., St. L., S.M.. H.M.
repanda *Dej*. [baltimorensis *Hbst*.]. A.O., St. L.
var. 12-guttata *Dej*. St. L., B.C., S.M., H.M.

CARABIDÆ.

Trachypachys inermis *Mots*. B.C.
Cychrus nitidicollis *Chev*., *var*. Brevoorti *Lec*. A.O., St. L.
Carabus Mæander *Fisch*., [palustris *Fisch*.] [Lapilayi *Lec*.]. St. L., N.O., C.L., O., N., C.C.
Chamissonis *Fisch*. Y.F., O., N.
tædatus *Fab*. B.C., N.C., Y.F., O., N.
race Agassii *Lec*. W., C.R., R.A.
serratus *Say*. St. L., B.C., C.L.

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Calosoma calidum *Fab.* St. L., M.
tepidum *Lec.* B.C.

Elaphrus Clairvillei *Kirby.* B.C.
riparius *Linn.* St. L., O.
race californicus *Mann.* B.C.

Opisthius Richardsoni *Kirby.* B.C.

Notiophilus sibiricus *Mots.* [punctatus *Lec.*]. A.O., C.C.
Hardyi *Putz.* N.O., C.L., O.

Nebria Sahlbergi *Fisch.* B.C., N.C., N.
Mannerheimii *Fisch.* B.C.

Pelophila rudis *Lec.* O.K., N.
Ulkei *Horn.* N.

Nomius pygmæus *Dej.* H.M., O.K.

Bembidium punctatostriatum *Say.* A.O.
carinula *Chd.* [impressum *Fab.*]. A.O., O.K., O.
littorale *Oliv.* [paludosum *Sturm*]. B.C.
erasum *Lec.* [Mannerheimii *Lec.*]. B.C.
dilatatum *Lec.* St. L.
concolor *Kirby* [salebratum *Lec.*]. W.
quadrulum *Lec.* B.C.
planatum *Lec.* B.C.
complanulum *Mann.* B.C.
funereum *Lec.* B.C.
bimaculatum *Kirby.* N.O., C.L., O.
lucidum *Lec.* A.O., St. L., B.C., Y.F.
picipes *Kirby.* T.L.
Grapei *Gyll.* [nitens *Lec.*]. C.L., O.
incrematum *Lec.* B.C.
patruele *Dej.* A.O., B.C.
nigripes *Kirby.* B.C., O.
versicolor *Lec.* B.C.
sulcatum *Lec.* B.C.
connivens *Lec.* B.C.
mutatum *G.* & *H.* [axillare *Lec.*]. B.C., O.
quadrimaculatum *Linn.* C.C.

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Patrobus longicornis *Say*. A.O., St. L., S.M.
septentrionis *Dej.* [hyberboreus *Dej.*]. O.K.
rugicollis *Rand.* St. L.
aterrimus *Dej.* B.C.

Pterostichus honestus *Say* [fastidatus *Dej.*]. A.O.
coracinus *Newm.* [adjunctus *Lec.*]. L'O., St. L., H.M., M.F., O.K.
punctatissimus *Rand.* Y.F., N.O., O.K., O.
lucublandus *Say* (Pæcilus). A.O., St. L., W., S.M., T.L.
caudicalis *Say*. A.O., St. L., W.
corvinus *Dej.* St. L.
scrutator *Lec.* (Lophoglossus). A.O.
orinomum *Leach*. A.O., St. L., B.C., N.C., Y.F., N.O., W., C. L., S.M., H.M., M.F., O.K., O., N., C.C., C.R.
Luczotii *Dej.* ("var. præc?"). A.O., St. L.
erythropus *Dej.* L'O., St. L., S.M.
patruelis *Dej.* A.O., St. L., T.L.
empetricola *Dej.* N.C.
mandibularis *Kirby*. St. L., C.L., O.

Amara avida *Say*. W.
similis *Kirby* [hæmatopus *Dej.*]. N.C., N.
rufimanus *Kirby* [reflexus *Putz.*]. Y.F.? N.O.
cylindrica *Lec.* N.O., W., C.L., O.
elongata *Lec.* N.
latior *Kirby* [libera *Lec.*]. St. L., T.L.
angustata *Say*. L'O.
pallipes *Kirby*. St. L.
impuncticollis *Say*. L'O., St. L., S.M., O.K., O.
littoralis *Mann*. C.R.
fallax *Lec.* St. L., B.C., W., C.L.
protensa *Putz*. N.O.
erratica *Sturm*. B.C., H.M., T.L., N.
interstitialis *Dej.* St. L., C.L., T.L., O., N.
obesa *Say*. W., S.M.
musculus *Say*. W., N.

(To be continued.)

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 120, Volume xxii.)

Genus ANTARCTIA Hbn.

1816—Hübner, Verzeichniss, 192.
1864—Pack., Proc. Ent. Soc., Phil., III., 122.
1873—Stretch, Zyg. & Bomb., 191.

The head is small and retracted; tongue obsolete, palpi very small and weak; antennæ moderately long, bipectinated in the male, simple in the female: the pectinations are long and extend to the tip; legs short and weak, all the spurs present, but very short: the two pairs of the posterior tibiæ close together. The tarsal claws are as in *Spilosoma*, and, indeed, there is no structural difference between these two genera. *Antarctia* has shorter, broader wings, somewhat longer vestiture, and is not white!

Primaries with 7 to 10 stalked, the branches arising in pairs; 3 to 5 from the end of the median, and about one-half closer to 5 than to 6. Secondaries 6 and 7 together from the end of the sub-costal; 8 rather closer to base than usual; 4 and 5 together from the end of the median, 3 very close to the end.

A. punctata Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 123, *Antarctia.*
1873—Stretch, Zyg. & Bomb., 192. =*vagans.*
1875—Edw., Proc. Cal. Ac. Sci., V., 188, *Antarctia.*
rufula ♀ Bdv.
1855—Bdv., Ann. Soc. Ent. Fr., 1855, Bull., p. 32, *Nemeophila.*
1868—Grt. & Rob., Cat. Lep. N. A., *Nemeophila.*
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 79 *Arctia.*
1870—Grt. & Rob, Tr. Am. Ent. Soc., III., 175, *pr. syn.*
1875—Edw., Proc. Cal. Ac. Sci., V., 367, *pr. syn.*
1881—Neum., Papilio, I., 80, *pr. syn.*
var. *proba* Hy. Edw.
1881—Edw., Papilio, I., 39, *Antarctia.*
Habitat—Sierra Nev., California, Oregon.

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A. rubra Neum.

1881—Neum., Papilio, I., 79, *Antarctia.*
1881—Butl., Ann. Mag. N. H., ser. 5, VIII., 311, *Antarctia.*
Habitat—Oregon, California.

A. vagans Bdv.

1852—Bdv.*, Lep. Cal. (Ann. Soc. Ent. Fr., 2 ser. X., 322), 50, *Arctia.*
1856—Wlk., C. B. Mus., Lep. Het. III., 630, *Phragmatobia.*
1860—Clem., Pr. Ac. N. Sci. Phil. XII., 336, *Phragmatobia.*
1862—Morris, Synopsis, 346, *Phragmatobia.*
1864—Pack., Proc. Ent. Soc. Phil., III., 122, *Phragmatobia.*
1868—Grt. & Rob., Cat. Lep. N. Am., *Phragmatobia.*
1869—Bdv., Lep. Calif. (Ann. Soc. Ent., Belg., XII.), 79, *Arctia.*
1873—Stretch, Zyg. & Bomb., 192, pl. VIII., ff. 8–12, *Antarctia.*
pteridis Hy. Edw.
1875—Edw., Proc. Cal. Ac. Sci., V., 264, *Antarctia.*
1875—Edw., Proc. Cal. Ac. Sci., V., 367, *pr. syn.*
var. *rufula* Bdv.
1852—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 80, *Arctia.*
1873—Stretch, Zyg. & Bomb., 192, *pr. syn.*
1881—Neum., Papilio, I., 79, *pr. var.*
Habitat—California, Vancouver.
Food plant—*Lupin* (Stretch).

A. walsinghami Butl.

1881—Butl., Ann. & Mag. N. H., ser. 5, VIII., 311, *Antarctia.*
Habitat—Oregon.

The synonymy in this genus is far from settled. There are probably fewer species than are given here. At all events, I do not see why *rufula* must not replace *punctata* Pack., for, though the male was a mere variety of *vagans*, the female referred to a good species, and the name cannot be dropped, because in part a synonym. I have not made the change here, but content myself with calling attention to the necessity for it.

Genus LEUCARCTIA Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 124.

Head small and retracted; palpi short; tongue short and weak. Antennæ short, pectinated in both sexes, the pectinations in the female

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short, but nearly as long as those of the male. Legs short and stout, anterior tibiæ with a short stout spine at either side of tip; middle and posterior tibiæ with minute terminal spurs only. The claws of tarsi are toothed in both sexes.

Primaries with 7 to 10 from a stalk in the order 10, 7, 8, 9; 3 to 5 from end of median, 4 nearer to 5 than to 3.

Secondaries 6 and 7 from same point at end of sub-costal; 8 from sub-costal half way to base; 3 to 5 almost equidistant from end of median.

Moeschler, in 1876, Stett. Ent. Zeit., XXXVII., 297, makes this a synonym of *Spilosoma*.

L. acræa Drury.

1770—Drury, Exot., I., pl. III., f. 2 (♀) and 3 (♂), *Phalæna*.
1793—Fabr., Ent. Syst., III., 1, 451, *Bombyx acria*.
1797—Sm. & Abb *, Ins. Ga., II., 133, pl. 67, *Phalæna acria*.
1816—Hüb., Veizeichniss, 184, *Estigmene*.
1820—Hüb., Samml. Auss. Schmett, II., pl. 404, *Estigmene acria*.
1823—Harris*, Mass. Agr. Repos. & Journ., VII., 323, *Arctia*.
1833—Harris, Cat. Ins. Mass., 591, *Arctia*.
1837—Westw., ed Dru., I., 7, *Spilosoma*.
1841—Duncan*, Nat. Libr., XXXII., 171, pl. 20, ff. 1–3, *Spilosoma*.
1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 53, *Spilosoma*.
1862—Morris*, Synopsis Supplt., 342, *Spilosoma*.
1862—Harris*, Inj. Ins., Flint, ed. 351, f. 169, pl. VI., ff. 9 (♂) and 10 (♀), *Spilosoma*.
1864—Pack., Proc. Ent. Soc., Phil., III., 125, *Leucarctia*.
1869—Bdv., Lep. Calif. (Ann. Soc. Ent., Belg., XII.), 78, *Arctia acria*.
1873—Stretch*, Zyg. & Bomb., 99, pl. 4, ff. 1–3, and pl. 10, f. 6, *Leucarctia*.
1874—Morrison, Psyche, I., 21, *Leucarctia*.
1875—Edw.*, Proc. Cal. Ac. Sci., V., 368, *Leucarctia*.
1883—Weed, Papilio, III., 84, *Leucarctia*.
1883—Grt., Papilio, III., 84, *Leucarctia*.
1883—Stretch, Papilio, III., 141, *Leucarctia*.
1884—Bean*, CAN. ENT., XVI., 66, *Spilosoma*.
1886—Smith, Ent. Amer., II., 79, *Leucarctia*.

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pseuderminia Peck.
1823—Peck., Mass. Agr. Rep. & Journ., VII., 328, pl. 1, *Arctia.*
1837—Westw., ed. Drury, I., 7, *pr. syn.*
1855—Wlk., C. B. Mus., Lep. Het., III., 667, *Spilosoma.*
caprotina Drury.
1770—Dru., Exot., I., pl. 3, f. 3, *Phalæna.*
1782—Cram., Pap. Exot., III., 170, pl. 287, f. C, *Phalæna.*
1797—Sm. & Abb., Ins. Ga., II., 133, *pr. syn.*
1837—Westw., ed. Dru., I., 7, *pr. syn.*
californica Pack.
1864—Pack., Proc. Ent. Soc., Phil., III., 125, *Leucarctia.*
1872—Pack., 4th Rept. Peab. Ac., 86, *pr. syn.*
packardii Schaupp.
1882—Schaupp, in Check List Bkln. Ent. Soc., 8, *Spilosoma.*
Habitat—United States and Canada.
Food plant—Omnivorous.

L. albida Stretch.
1873—Stretch, Zyg. & Bomb., 203, pl. 8, f. 22, *Leucarctia.*
1875—Butler, Cist. Ent., II., 36, *an sp. dist. virginica ?*
1876—Stretch, Rept. Geol. Surv., west 100 merid., V., 798, pl 40, ff. 4 and 5, *Leucarctia.*
Habitat—California.

The *Arctia scuirus* of Boisduval was referred by Grote and Robinson to *acræa*, but is now recognized as referring to *Euchaetes collaris !* The peculiar male characters of the *acræa* have been described by Mr. Morrison, and later figured by myself.

Leucarctia permaculata Pack. is an *Ecpantheria*, and is referred to under that genus. I do not find the species in Mr. Grote's list, but perhaps it may be referred to in some paper which I have not seen.

(To be continued.)

Mailed July 4th.

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The Canadian Entomologist.

VOL. XXII. LONDON, AUGUST, 1890. No. 8.

THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA COMPARED.

(Eighth and Last Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Catocalini.*

In this tribe the secondaries are oftenest gaily coloured (mostly yellow) and banded, still subordinated to the primaries which show, more or less adequately, the usual Noctuidous ornamentation. The abdomen is rarely tufted. On account of the shape of the primaries, the form of the abdomen, the abdominal tuftings, the pattern of the wings beneath, the approach to *Ophideres*, I regard the genus and species *Euparthenos nubilis*, Ann N. Y. Lyc. Nat. Hist., as entirely distinct from *Catocala* sp. The most important genus is *Catocala*, in Europe with 22, in North America with upwards of 100 species. A division of this genus on the peculiarities of tibial armature (as I have suggested in *Agrotis*) was stated to me as possible several years ago by Mr. Smith, and has more recently been attempted by Mr. Hulst. I must think that his observations need verifying, judging from his published opinions on the value of the forms of *Catocala*, which I have shown to be in a number of instances incorrect. The *Ophiderinæ* and *Toxocampinæ* of my Check List are probably not to be separated from this tribe, in which the anterior ventral feet of the larvæ are more or less incomplete. The genera become gradually broader winged and concolorous as we approach the next tribe.

Tribe *Pheocymini.*

This comprises the *Erebiinæ* of my Check List. The wings are marked by rivulous lines crossing both pair and recalling the Spanner

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moths. The tibiæ are variously armed, but become unarmed in the weaker genera, *Homopyralis*, etc., and as we approach the *Deltoidinæ*. In Europe this tribe seems represented only by *Pericyma* and *Zethes*. As we go southward the moths of this tribe become more numerous and we find the largest *Noctuidæ* among them in *Erebus* and *Thysania*. The tribe is tropical and subtropical, and some of the species are summer migrants from the South, not breeding in the Middle and Eastern States, or Canada.

There remain to be considered certain tropical forms which are found in Florida, or accidentally on our coast, such as *Hexeris enhydris*, *Syllectra erycata* and *Brotis vulneraria*. These probably are to be separated as affording distinct tribal types, but I cannot at the moment compare their structure with that of their South American allies. The tribe *Pangraptini*, with the frail genera *Pangrapta* and *Phalaenostola*, seems to close the series and lead to the Deltoids. The North American genera must be compared here with their tropical allies. This element of our fauna comes from the south, and, as we have seen, is almost wanting in Europe.

Sub-family *Deltoidinæ*.

This sub-family was formerly regarded as belonging to the *Pyralidæ*. In the vernacular the Deltoids are called "Snout Moths," from the long labial palpi. But Herrich-Schæffer showed that in their essential characters they conform to the Noctuid type; they are pyralidiform *Noctuidæ*. The wings are usually pointed at the tips, the colours are gray and dusty, the usual Noctuid ornamentation is hardly to be discerned. The eyes are always naked. They fall into two principal tribes. The character of this sub-family becomes again largely European. As the name "Snout Moths" refers to this sub-family, I have called the *Pyralidæ* by the name of Sparkler Moths.

Tribe *Herminiini*.

The type of this tribe is the European *Herminia tentacularis*, to which our North American *Philometra* is related. The wings are concolorous, marked with continuous lines, reminding us of the *Pheocymini* and the *Geometridæ*. The antennæ are often furnished with sexual nodosities. The species fly in grass upon which the larvæ generally feed.

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One of the most variable *Noctuidæ* known to me belongs to this tribe, *Zanclognatha lævigata*. Our species resemble generally the European, but are much more numerous.

Tribe *Hypenini.*

The type of this tribe is the European *Hypena proboscidalis*. The hind wings are unicolorous and subordinate to the primaries, which show the usual Noctuid markings more or less distinctly. The body is sometimes tufted, the brush-like antennæ are simple. In *Bomolocha* the eyes are lashed, but this character has nothing to do with the hairiness or nakedness of the eye itself, which, in the *Deltoidinæ*, so far as I know, is always naked. This nakedness is a general characteristic of the lower moths. I know of only one Geometrid with hairy eyes. The genera in my Check List, down to *Hypenula*, referred to this tribe, should probably be included in the preceding.

Sub-family *Brephinæ.*

The members of this small sub-family group are boreal or sub-boreal in their habitat, and resemble certain *Geometridæ*, inhabiting similar zoological zones, in their hairy body, a more or less marked diurnal flight, and the 16-footed larvæ. The ocelli are wanting, and this character excludes the Californian genus *Annaphila*, which is really related to *Eustrotia (Erastria)*, but has a certain resemblance in colours to this sub-family and the *Catocalini*. Our single species, *Brephos infans*, is found from Labrador to New England. Another form, *Leucobrephos brephoides*, I identified originally from Hudson's Bay. It may be the same with a species described by me from Wisconsin, and, among the figures of Siberian moths which I have examined, is one which, I think, represents a form belonging to this North American genus. Europe has three species of *Brephos* Hübn. (nec. Ochs.). The name *Brephos*, like *Agrotis*, etc., was originally proposed by Hübner. Through neglect and corruption, Hübner's names became credited to other European writers. I have done my best to clear up the generic synonymy by indicating the types in my Buffalo Lists. The student is referred to these for special information on this point.

Although the Owlet moths are quite numerous in the east, yet the Western States of North America seem richer in genera and

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species. The different elements among the numerous genera need bringing out, but it has been sufficiently shown here where the general lines of relationship are to be sought. Like the Hawk moths, these too have been redistributed by climatic changes, the most important of which was the Glacial Epoch. We receive a large accession from the south, but the bulk of our *Noctuidæ* show a northern parentage. The common ancestors of certain of the European and American Owlet moths of to-day had, at one time, a common sporting ground. I have shown the existence of every grade of resemblance from undistinguishable species like *Scoliopteryx libatrix* and *Dipterygia pinastri*, through slightly modified forms like *Apatela occidentalis*, *Dianthoecia bella*, *Copimamestra occidenta*, *Agrotis normaniana*, *Lithophane Thaxteri*, to forms readily distinguishable in all their stages by the experienced student. The mass of species is so great that detailed observations on each particular one must await time; but I trust I have laid down the lines by which our Owlet moths are to be studied until our information with regard to them is perfected.

Some idea of the preponderance of *Catocalinæ* in North America may be given by the statement that in Europe there are about fifty-six species belonging to about sixteen genera, while in North America there are about two hundred and fifty species belonging to about fifty-six genera. These latter figures may be changed by new observations with us, but hardly diminished. In the *Deltoidinæ* the proportions are more in conformity with the numerical relations in the typical group, the *Noctuinæ*. The reason I have given for this preponderance of the *Catocalinæ*, lies in the physical geography of the continent, the prevailing atmospheric and ocean currents, all of which favor the introduction of southern or tropical lepidopterous forms. And we must consider the *Catocalinæ* as tropical in general character in the same way as we consider the other groups of the *Noctuidæ* as belonging to temperate regions of the earth's surface.

In a general view of the evolution of the Lepidoptera we may conceive it as represented by an inverted and spreading bell of net work, in hanging threads of unequal lengths, branching variously and in different directions, and ever widening in departure and circumference. The depending tips of the threads represent the existing species, all connected with the past, and the task before us is the tracing of the threads, always running here and there together, grouping themselves about thicker strands, converging in the hand of time. The means at our disposal for the un-

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ravelling are the characters of existing species in *all* their stages, and the sadly imperfect, almost failing, record of fossil species. To add to the difficulty, the species have been distributed and redistributed, affected by geological changes, modified by differences in temperature, moulded by the winds. It is clearly impossible to arrange existing species in a linear series and thereby express also their probable descent. We can only group them according to natural characters and for purposes of convenience. Undoubtedly our categories, through their characters, correspond vaguely to the general plan of evolution. But the arrangement of our catalogues and collections must remain artificial in the main, conditioned by our own physical limitations. Our mental picture of these insects remains relatively imperfect, but enlarges through new studies and fresh thoughts.

ERRATA ET ADDENDA.—Vol. XXI., p. 123, line 10, for *Noctuidæ* read *Noctuinæ*; id., p. 155, line 30, for *Dasychininæ* read *Dasychirinæ*. The first three North American genera in the list, on p. 157, I refer to the tribe *Bombycoidi*, the rest to the *Apatelini;* the tribal divisions accidentally omitted. Id., p. 189, line 34, for merely read mainly. In connection with my remarks on *Gortyna*, p. 192, I refer to my paper on this genus and *Ochria*, p. 139, written subsequently. Id., p. 229, line 19, insert "apices of the" before "still pointed primaries"; id., p. 230, line 29, for *pyramided* read *pyramidea*; id., p. 230, after *saucia* insert *clandestina*; Vol. XXII., p. 29, line 23, for *Calopharia* read *Calophasia*; id., p. 30, line 2, for form read tribe; id., p. 30, line 9, for slimy read shiny; id., id., line 17, for *Hatney* read *Hatuey;* id., p. 28, line 3, dele "or *Morrisoni*." Dr. Thaxter inclines to consider *sidus* = *vinulenta*, while I sought for it in red forms of *Walkeri*. The latter species is nearer the European *satellitia*, which *tristigmata* also resembles. Without Guenée's type I think no certainty can be obtained. While I think the outlines of a more correct classification of the family are here given, certain points remain to be discussed, such as the separation of *Ingura* as a distinct tribe, while the location of certain genera will be altered when minuter comparisons can be made and the full life history of the species is known. As nature did not produce these creatures in a linear series, one after another, we can only approximately exhibit their relations in our catalogues and collections.

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A REPLY TO MR. W. H. EDWARDS.

BY H. J. ELWES, PRESTON, CIRENCESTER, ENGLAND.

I am surprised to see in the May number of the CANADIAN ENTOMOLOGIST a criticism of my paper on "Argynnis" in a style which is not easy to reply to, and which is certainly not justified by the paper itself. Mr. Edwards seems to think that no one has a right to question his opinions on butterflies until they have seen the so-called types from which his original descriptions were made, and that the practical monopoly which he has lately held in the description of new species in the United States gives him the position of an oracle. He accuses me of haste and carelessness, of not having taken the trouble to see what I could easily have seen, and implies that I have not seen the species I have written about. I will only ask those who may be interested, to read my paper* in full and not to judge from the abridgement of it which was published in the March number of *Psyche*. I will also ask them to refer to *Papilio*, Vol III., p. 152. It will there be seen that I have for seven years been collecting all available material for the better understanding of a genus which, naturally difficult in itself, has been rendered doubly so by Mr. W. H. Edwards. It will be seen that in 1883 I had publicly, as well as privately, asked him to inform me how I could identify species which had been described by him, often from very imperfect or scanty specimens—sometimes in such inaccessible publications as *Field and Forest*, and usually, if not always, without giving any characters by which the species could be distinguished from its near allies. To these questions I have received no reply. My valued correspondent, Mr. H. Edwards, "whose judgment in doubtful cases Mr. W. H. Edwards relies on above all persons," had kindly sent me a considerable number of the rarer western forms named by himself. Mr. H. Strecker, who certainly has as good an eye for, and as good a judgment of species as almost any one I met in America, sent me many more, and in various ways I had collected all the known so-called species except four, of two of which I had seen the types, so that I have, as I believe, a larger and better series than any one in Europe or in any of the collections I was able to examine in America. I did not therefore write hastily or carelessly, and the numerous queries in my synopsis show how uncertain I still felt of the proper position and specific value of many of

* A copy will be sent, as long as they last, to any Entomologist who will write for it to me at Preston, Cirencester, England.

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the western forms. After having repeatedly tried to find in Mr. Edwards's published figures, all of which I have carefully studied, any help in separating these doubtful forms, I had visited and examined the collections of Mr. Holland (who, I was informed, had acquired Mr. Edwards's types), of the Harvard Museum; of Messrs. H. Edwards, Strecker, Neumogen, Hulst, Scudder and Dr. Behr, to all of whom my best thanks are due; after having gone through all the American and European literature and museums, and written to every one from whom I hoped to learn anything, and after having collected personally in Southern and Northern California and the Yellowstone Park, I am told I have no claim to know anything about "Argynnis," as I have seen mostly second or third rate collections. (Where then are the first rate ones that I did not see?)

I am pleased to learn, that whatever Mr. Edwards's opinion of my work may be, it is not shared by all of his countrymen, from three of the most able of whom I have received flattering approvals of my attempt to enable others to understand this genus, and to arrange their collections on a more rational basis. Mr. Edwards implies that I pay no regard to local variation, that I do not allow that locality is any help in deciding the name of a species, and am generally inclined to lump everything that I do not know.

Will he then see how slight a difference is sufficient in my eyes to separate a local variety, as in the case of the Himalayan form of *A. lathonia*, or a local race worthy to be called a species, such as *A. montinus*, and how I have tried to make these slight differences clear to my readers, as in the case of *A. helena*?

Let him do the same with *Chitone*, *Cipris*, *Inornata*, *Hippolyta* and others, and he will find me the most appreciative of his followers.

But when he rambles on in the way he sometimes does, failing to recognize his own species when they are sent to him for name from unexpected localities, as I am told he has done, I can only say that the fact of a butterfly being confined to one station is not enough to separate it specifically unless it has through isolation or climatic influences developed some peculiarity by which it may invariably be recognized as having come from that place. I do not blame him for describing such things twenty years ago, but I say that now, after he has himself proved by breeding the extraordinary amount of variation to which many species are subject, he has no right to expect anyone at once to recognize as a species such a

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form as *Argynnis Alberta*, which he has just described from one ♂ and two ♀ sent him by Mr. Bean.

It would be useless for me to reply in detail to his remarks upon particular species, because he will always fall back upon his so-called types, whilst others must rely on his published work, if they can get it, and if not, upon the best materials they can get. No doubt there are many errors in my arrangement which only time and better knowledge can clear up. I shall welcome the criticism of any one who will show me where I am wrong, and who has better means of coming at the truth than I have, but I am quite content to live under Mr. Edwards's aspersions in such good company as that of Dr. Hagen, and hope that Mr. Edwards will think better of us both when he gets cooler.

A NEW PSEUDOSCORPION.

BY NATHAN BANKS, ITHACA, N. Y.

Upon looking over the specimens of this family, which I had collected during the past few years near Ithaca, I discovered a new species of *Chernes*, which may be characterized as follows :—

Chernes pallidus, nov. spec. Length about 2 m.m.; body ovate oblong ; cephalothorax a little broader behind than in front ; finely serrulate on the margin ; body finely granulate and furnished with short, yellowish, clavate hairs. Abdomen pale yellowish ; cephalothorax reddish near anterior end ; palpi a uniform red ; legs yellowish ; no light median line on dorsum. No eyes ; palpi stout, longer than the body ; 3rd joint nearly as long as cephalothorax, and three times as long as 2nd ; 4th a little shorter than 3rd ; hand large and stout, fingers a little curved. Larger than *C. Sanborni* H. and *C. oblongus* Say, the palpi larger and longer, and the legs much stouter than in these species. In *C. Sanborni* H. the 3rd joint of palpi is but twice as long as the 2nd. *C. oblongus* is smooth, not granulate ; one specimen, Ithaca.

The following species are also found near Ithaca : *Chernes Sanborni* H., several specimens ; *Chernes oblongus* Say, more common ; *Chelifer cancroides* L., in houses ; *Chelifer muricatus* Say, one specimen ; *Obisium bruneum* H., several specimens ; *Chthonius pennsylvanicus* H., three specimens.

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ON THE LISTS OF COLEOPTERA PUBLISHED BY THE GEOLOGICAL SURVEY OF CANADA, 1842–1888.

BY W. HAGUE HARRINGTON, OTTAWA.

(Continued from page 140, Vol. xxii.)

Diplochila major *Lec.* [Rhembus]. A.O.
Calathus gregarius *Say*. L'O., St. L.
ingratus *Dej*. N.C., C.L., O.K., O., N., R.A.
race confusus *Lec*. B.C.
mollis *Esch.*, *race* lenis *Mann*. B.C.
impunctatus *Say*. St. L.
Platynus maurus *Mots*. [stygicus *Lec.*]. Y.F.
sinuatus *Dej*. A.O., St. L., B.C., C.L., T.L., O.
extensicollis *Say*. St. L,
anchomenoides *Rand*. B.C.
tenuis *Lec*. St. L.
melanarius *Dej*. St. L., B.C., C.L.
affinis *Kirby*. M.F.
metallescens *Lec*. O.K., O.
deceptivus *Lec*. O.K.
cupripennis *Say*. L'O., St. L., W., S.M.
perforatus *Lec*. O.
placidus *Say*. St. L., W.
cupreus *Dej*. W., S.M., C.C.
Bogemanni *Gyll.* [obsoletus *Say*]. A.O., W., S.M., M.F., O., N., C.R.
race strigicollis *Mann*. B.C.
quadripunctatus *DeG*. W., O.
sordens *Kirby*. T.L.
ruficornis *Lec*. N.C., N.
retractus *Lec*. A.O., St. L., B.C., W., O.K.
picipennis *Kirby*. St. L.
lutulentus *Lec*. St. L.
Lebia cyanipennis *Dej*. B.C.
viridis *Say*? A.O.
Metabletus americanus *Dej*. [borealis *Zimm.*]. B.C., N.O.
Cymindis cribricollis *Dej*. [reflexa *Lec.*]. L'O., St. L., B.C., N.O. H.M., O.K., C.R.

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Chlænius sericeus *Forst.* L'O., St. L., S.M.
leucoscelis *Chev.* [chlorophanus *Dej.*]. St. L.
tricolor *Dej.* L'O., St. L.
pennsylvanicus *Say.* O.K.
impunctifrons *Say.* A.O.
Agonoderus pallipes *Fab.* W.
Harpalus amputatus *Say.* W.
viridiæneus *Beauv.* St. L.
pennsylvanicus *DeG.* L'O., W., S.M.
megacephalus *Lec.* St. L.
pleuriticus *Kirby.* St. L., W., C.L., S.M., O., N.
herbivagus *Say.* L'O., N.O., W., S.M.
cautus *Dej.* B.C.
rufimanus *Lec.* St. L.
oblitus *Lec.* B.C.
basilaris *Kirby.* B.C.
ruficornis (misprint?). B.C.
Stenolophus conjunctus *Say.* B.C., S.M.
Bradycellus cognatus *Gyll.* O.K.
rupestris *Say.* W.
Tachycellus nigrinus *Dej.* [Bradycellus]. T.L.
Anisodactylus piceus *Mén.* B.C.
rusticus *Dej.* L'O.
californicus *Dej.* [confusus *Lec.*]. B.C.
Harrisii *Lec.* L'O., St. L.
baltimorensis *Say.* L'O., S.M.

Haliplidæ.

Haliplus cribrarius *Lec.* A.O.
ruficollis *DeG.* (immaculaticollis *Harr.*). A.O.

Dytiscidæ.

Laccophilus proximus *Say.* C.L.
Cœlambus inæqualis *Fab.* [Hydroporus]. H.M.
ovoideus *Lec.* [Hydroporus]. Y.F.
impressopunctatus *Sch.* [Hydroporus]. Y.F.

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Deronectes depressus *Fab.* [Hydroporus rotundatus *Lec.*]. O.K.
griseostriatus *DeG.* [Hydroporus]. B.C.
Hydroporus proximus *Aubé.* A.O.
sericeus *Lec.* H.M.
alpinus *Payk.* O.
tartaricus *Lec.* Y.F.
tristis *Payk.* [subtonsus *Lec.*]. Y.F.
modestus *Aubé.* Y.F.
Ilybius confusus *Aubé.* H.M., N.
Coptotomus interrogatus *Fab.* A.O.
Agabus parallelus *Lec.* O.K.
seriatus *Say.* A.O., St.L.
punctulatus *Aubé.* N.
anthracinus *Mann.* [scapularis *Mann.*]. B.C.
infuscatus *Aubé.* B.C.
Erichsoni *G. & H.* [nigroæneus *Er.*] [lutosus *Cr.*]. B.C., N.C., O.K.
dissimilis *Sahl.* [Gaurodytes longulus *Lec.*]. Y.F.
Rhantus binotatus *Harr.* [Colymbetes]. B.C., S.M.
tostus *Lec.* [Colymbetes]. B.C.
Colymbetes sculptilis *Harr.* [Cymatopterus]. B.C., M., H.M., O.K., N.
Dytiscus circumcinctus *Ahr.* [anxius *Mann.*]. B.C., N.C.
dauricus *Gebl.* [confluens *Say*]. St.L., N.C., M.F., O., N.
Harrisii *Kirby.* H.M.
lapponicus [*Gyll?*]. O.K.
Acilius semisulcatus *Aubé.* H.M.
fraternus *Harr.*. L'O.

GYRINIDÆ.

Gyrinus confinis *Lec.* M.F.
limbatus *Say.* H.M.
ventralis *Kirby.* B.C., O., C.C.
affinis *Aubé.* M.F.
pectoralis *Lec.* H.M.
borealis *Aubé.* H.M., N.
picipes *Aubé.* B.C.
Dineutes emarginatus *Say.* O.K.

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HYDROPHILIDÆ.

Helophorus lineatus *Say*. Y.F.
Berosus striatus *Say*. W.
Philhydrus cinctus *Say*. A.O.
perplexus *Lec*. Y.F., T.L.
Hydrobius fuscipes *Linn*. B.C., Y.F.

SILPHIDÆ.

Necrophorus Sayi *Lap*. [lunatus *Lec*.]. A.O.
marginatus *Fab*. [Silpha]. A.O.
vespilloides *Hbst*. [pygmæus *Kirby*]. A.O., M., O., N.
tomentosus *Web*. [velutinus *Fab*.]. St.L.
Silpha surinamensis *Fab*. L'O., T.L.
lapponica *Hbst*. St.L., B.C., N.C., N.O., C.L., M., H.M., O., N.
trituberculata *Kirby*. N.C., C.L.
americana *Linn*. S.M., M.F.
Choleva basillaris *Say* [Spenciana *Kirby*]. B.C., M.F., O.K.
Liodes globosa *Lec*. S.M.

STAPHYLINIDÆ.

Quedius fulgidus *Fab*. B.C.
lævigatus *Gyll*. T.L.
Listotrophus cingulatus *Grav*. W., S.M.
Creophilus villosus *Grav*. [Staphylinus]. St.L., B.C., N.O., C.L., O.
Philonthus æneus *Rossi*. S.M.
cyanipennis *Fab*. A.O.
Lathrobium simile *Lec*. N.C.
Pæderus littorarius *Grav*. L'O.
Tachinus fumipennis *Say* (conformis *Dej*.). A.O.
Tachyporus jocosus *Say*. O.
Oxytelus pennsylvanicus *Er*. A.O.
Porrhodites fenestralis *Zett*. O.
Olophrum rotundicolle *Sahlb*. O.
Anthrobium pothos *Mann*. A.O., B.C.

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Coccinellidæ.

Anisosticta strigata *Thunb.* O.
Hippodamia 5-signata *Kirby.* B.C., N.C., N.
13-punctata *Linn.* L'O., N., C.C.
Coccinella trifasciata *Linn.* B.C., S.M., N.
9-notata *Hbst.* [novemnotatem *Fab.*]. St.L.
transversoguttata *Fab.* [5-notata *Kirby*]. B.C., N.
Harmonia picta *Rand.* [Coccinella]. A.O., B.C., H.M., M.F., T.L.
12-maculata *Gebl.* [Coccinella]. N.C.
Mysia pullata *Say.* S.M.
Anatis 15-punctata *Oliv.* N.O., N., R.A.
Psyllobora 20 maculata *Say.* B.C.

Cucujidæ.

Pediacus fuscus *Er.* (planus *Lec.).* A.O., St.L., N.O., S.M., O., C.C.
Cucujus clavipes *Fab.* A.O.
puniceus *Mann.* B.C.

Dermestidæ.

Dermestes caninus *Germ.* [nubilus *Say*]. O.
talpinus *Mann.* B.C., N.O.
lardarius *Linn.* A.O., S.M., N.
Attagenus piceus *Oliv.* [megatoma *Fab.*]. O.
Trogoderma tarsale *Melsh.* [inclusum *Lec.*]? O.
Anthrenus musæorum *Linn.* (castaneæ *Melsh.*). A.O.

Histeridæ.

Hister abbreviatus *Fab.* S.M.
depurator *Say.* B.C., S.M.
perplexus *Lec.?* L'O.
parallelus *Say* (Platysoma). A.O.
Dendrophilus punctulatus *Say.* S.M.
Saprinus oregonensis *Lec.* N.O., S.M.
fraternus *Say.* S.M.
mancus *Say.* S.M.
estriatus *Lec.* B.C.

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NITIDULIDÆ.

Carpophilus niger *Say*. A.O.
Epurœa rufa *Say*. S.M.
immunda *Sturm*. O.K.
Nitidula bipustulata *Linn*. S.M.
Omosita colon *Linn*. St.L.
discoidea *Fab*. B.C.
Ips fasciatus *Oliv*. (4-signatus *Say*) [4-guttatus *Fab*.]. L'O., T.L.

TROGOSITIDÆ.

Peltis ferruginea *Linn*. B.C.
Calitys scabra *Thunb*. [dentata *Fab*.] B.C.
Thymalus fulgidus *Er*. C.R.

BYRRHIDÆ.

Cytilus sericeus *Forst*. (varius *Fab*.). L'O.
trivittatus *Melsh*. B.C.
Byrrhus Kirbyi *Lec*. [picipes *Kirby*]. St.L., B.C.

DASCYLLIDÆ.

Scirtes tibialis *Guér*. N.O.
Cyphon variabilis *Thunb*. S.M.

ELATERIDÆ.

Adelocera rorulenta *Lec*. B.C.
profusa *Cand*. B.C.
Cryptohypnus abbreviatus *Say* [silaceipes *Germ*.). A.O., B.C., S.M.
Elater nigrinus *Payk*. O.K., N.
luctuosus *Lec*. O.
apicatus *Say*. W., S.M.
Agriotes mancus *Say*. S.M.
stabilis *Lec*. (Dolopius). A.O.
fucosus *Lec*. (Dolopius). A.O., W., S.M.
oblongicollis *Melsh*. S.M.
Dolopius lateralis *Esch*. S.M.
Sericosomus incongruus *Lec*. B.C., N.

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Corymbites virens *Schr.* [æneicollis *Ol.*]. B.C., O.K., O., N.
resplendens *Esch.* N.
spinosus *Lec.* O.
caricinus *Germ.* [umbricola *Esch.*]. B.C.
ochreipennis *Lec.* O.K., N., R.A.
triundulatus *Rand.* A.O., N.O.
cruciatus *Linn.* B.C., S.M.
Suckleyi *Lec.* B.C.
æripennis *Kirby.* B.C., C.L., O.
metallicus *Payk.* O.
Asaphes memnonius *Hbst.* S.M.

Buprestidæ.

Chalcophora virginiensis *Drury.* S.M.
Dicerca prolongata *Lec.* B.C., W., C.L., O., N.
tenebrosa *Kirby.* B.C., M., O.
Buprestis consularis *Gory.* S.M.
Nuttalli *Kirby.* N.C., N.O., O., N., C.C.
maculiventris *Say* (Ancylochira). A.O., St.L., M., O.K.
rusticorum *Kirby.* C.L., S.M., H.M., O.
fasciata *Fab.* S.M.
race Langii *Mann.* W.
Melanophila acuminata *DeG.* [longipes *Say*] [appendicula *Fab.*] B.C., W., S.M., N., C.C., C.R.
Drummondi *Kirby.* B.C., N.C.
Anthaxia æneogaster *Lap.* [inornata *Rand.*]. B.C.
Chrysobothris dentipes *Germ.* S.M.
trinervia *Kirby.* N.C., N.O., S.M., O.K.

Lampyridæ.

Calopteron terminale *Say* (Digrapha). A.O.
Celetes basalis *Lec.* O.K.
Eros simplicipes *Mann.* B.C.
aurora *Hbst.* [coccinatus *Say*]. A.O., B.C.
Plateros caniculatus *Say.* S.M.
lictor *Newm.* (mollis *Lec.*). A.O.

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Ellychnia corrusca *Linn.* A.O., St.L., N.C., S.M., M.F., O.K., T.L., O., N.
race lacustris *Lec.* A.O., Y.F.
Pyractomena angulata *Say.* A.O.
Photinus ardens *Lec.* S.M.
Photuris pennsylvanica *DeG.* L'O., S.M.
Podabrus modestus *Say.* A.O., W.
piniphilus *Esch.* B.C., N.C., (allied to piniphilus).
puberulus *Lec.* N.O., S.M.
lævicollis *Kirby.* B.C.
Telephorus fraxini *Say.* A.O., B.C., N.C., N.O., S.M.
carolinus *Fab.* A.O.
nigritulus *Lec.* N.O.
scitulus *Say.* S.M.
rotundicollis *Say.* A.O.
Curtisii *Kirby.* B.C.
grandicollis *Lec.* B.C.

MALACHIDÆ.

Collops tricolor *Say.* O.K.
vittatus *Say.* C.C.

CLERIDÆ.

Trichodes Nuttalli *Kirby.* L'O.
Clerus spegeus *Fab.* B.C.
Thanasimus dubius *Fab.* L'O.
undulatus *Say* [Clerus]. B.C., Y.F., N.O., C.L., S.M., O.
Hydnocera humeralis *Say.* R.A.
Necrobia violaceus *Linn.* [Corynetes]. B.C., T.L.

PTINIDÆ.

Hadrobregmus foveatus *Kirby* (Anobium). A.O., O.
Dinoderus substriatus *Payk.* C.R.

LUCANIDÆ.

Platycerus depressus *Lec.* A.O., St.L., B.C., S.M.

(To be continued.)

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 144, Volume xxii.)

Genus SPILOSOMA Steph.

1830—Steph., Ill. Br. Ent., Haust., II., 74.
1856—Wlk., C. B. Mus., Lep. Het., III., 663.
1860—Clem., Proc. Ac. N. Sci, Phil, XII., 531.
1873—Stretch, Zyg. & Bomb., 130.

Head small, retracted; tongue short and weak, membraneous; palpi very short and feeble. Legs moderate, rather short; tibial spurs present but very feebly developed. Fore tibiæ unarmed. Antennæ moderately long, bipectinated in the male, simple or serrate in the female. The tarsal claws are toothed in all the species examined. In *virginica* the posterior tarsi only, in *vestalis* all are toothed.

The primaries have the cell somewhat shorter than usual, veins 7 to 10 on a stalk from the end of the subcostal in the order 10, 7, 9, 8; 3 to 5 are from the end of the median, 4 rather closer to 5 than to 3.

Secondaries with 6 and 7 together from the end of the subcostal, 8 from same rather past the middle, 3 to 5 from the end of the median, 4 much closer to 3 than to 5.

S. antigone Strk.

1879—Strk., Rept. Chief Eng., 1878–79, V., p. 1860, *Spilosoma.*
1883—Grt., CAN. ENT., XV, 9, =*congrua.*
1886—Hulst., Ent. Amer., II., 162, =*congrua.*
1889—Smith, Ent. Amer., V., 121, *an sp. dist. congrua.*

S. congrua ‡ Grt.

1883—Grt., CAN. ENT., XV., 9, *Spilosoma.*
1886—Hulst*, Ent. Amer., II., 15, *Spilosoma.*
1889—Soule & Elliot*, Psyche, V., 259, life hist.

Habitat—Mass., N. Y., Ga., Colorado.

My reasons for this synonomy are given in Ent. Amer., V., 121. Walker's description does not apply to *antigone* at all, while it does apply to *cunea*, a specimen of which, according to Butler, was of the "types."

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S. latipennis Stretch.

1872—Stretch, Zyg. & Bomb., 133, pl. 6, f. 5, ♀, *Spilosoma.*

1874—Lint., Ent. Cont., III., 144, *Spilosoma.*

1883—Edw.*, Papilio, III., 190, *Spilosoma.*

1884—Hulst*, Bull. Bkln. Ent. Soc., VII., 120, *Spilosoma.*

Habitat—Buffalo, Albany and L. I., N. Y.; Mass., N. J.

This species seems to favor damp, almost swampy meadows. I have taken specimens in such localities very sparingly.

S. niobe Strk.

1884—Strk., Proc. Ac. Nat. Sci., Phil., XXXVI., 284, *Spilosoma.*

Habitat—Florida.

This species I do not know at all.

S. prima Slosson.

1889—Slosson, Ent. Amer., V., 40, *Spilosoma.*

Habitat—Franconia N. H., June.

Mrs. Slosson's captures at this locality indicate that there is a great deal yet to be done by the thorough collector in the mountainous parts of New England.

S. vestalis Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 125, *Spilosoma.*

1872—Stretch, Zyg. & Bomb., 133, pl. 6, ff. 7 (♂) and 8 (♀) *Spilosoma.*

1876—Edw.*, Proc. Cal. Ac. Sci., VII., 22, *Spilosoma.*

Habitat—California.

Food plant—*Lupinus* sp.

S. virginica Fabr.

1798—Fabr., Ent. Syst. Suppl., 437, *Bombyx.*

1833—Harris, Cat. Ins. Mass., 591, *Arctia.*

1841—Harris*, Rept. Ins. Mass., 248, *Arctia.*

1856—Wlk., C. B. Mus. Lep. Het., III., 668, *Spilosoma.*

1857—Fitch, 3rd Rept. Ins., N. Y., *Spilosoma.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 531, *Spilosoma.*

1862—Morris*, Synopsis, Supplt., 342, *Spilosoma.*

1862—Harris*, Inj. Insects, 350, ff. 167–168, *Arctia.*

1862—Morris in note to Harris, l. c., *Spilosoma.*

1863—Saunders, Syn. Can. Arct., 14, *Spilosoma.*

1871—Riley*, 3rd Rept. Ins. Mo., 68, f. 28, *Spilosoma.*

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1871—Riley*, Am. Ent., II., 272, f. 170, *Spilosoma.*
1872—Stretch*, Zyg. & Bomb., 131, pl. 6, f. 6, *Spilosoma.*
1873—Edw., Proc. Cal. Ac. Sci., V., 187, *Spilosoma.*
1878—Lint.*, Ent. Cont., IV., 143, *Spilosoma.*
1880—Saund.*, CAN. ENT., XII., 56, f. 9, *Spilosoma.*
1883—Saund.*, Fruit Insects, 271, f. 281, *Spilosoma.*
1884—Bean*, Papilio, IV., 66, *Spilosoma.*
1887—Bruce*, Ent. Amer., III., 140, *Spilosoma.*
1888—Dimmock, A. K., Psyche, IV., 281, *Spilosoma.*
Habitat—U. S. generally, Canada, Nova Scotia, H. B. Terr.

This species is the most widely distributed of the genus; its bibliography is very much more extensive than above given, if the economic literature be taken into account. The larva is omnivorous.

Genus HYPHANTRIA Harris.

1841—Harris, Rept. Ins. Mass., 255.
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 530.
1862—Harris, Inj. Insects, 358.
1873—Stretch, Zyg. & Bomb., 204.
1876—Moeschl., Stett. Ent. Zeit., XXXVII., 297.

Head small; tongue weak and short; palpi mere rudiments. Antennæ moderate in length, shorter and simple in the female, bipectinated in the male. Legs short and rather slender. Spurs of middle tibiæ very short and weak; posterior tibiæ with small terminal spurs only; anterior tibiæ with a small spine each side of tip. Claws simple.

Primaries with 7 to 10 on a stalk, 10 very close to the base of the stalk; 7, 8 and 9 close together near the apex; 3, 4 and 5 from the end of the median; 4 and 5 from the same point, or on a short stalk, 3 very close to 4.

Secondaries, 8 from subcostal past the middle; 6 and 7 on a long stalk from end of subcostal; 4 and 5 from the same point from end of median; 3 somewhat remote from 4.

Despite its superficial resemblance to *Spilosoma* this is really a strongly marked genus.

H. cunea Dru.
1770—Drury, Ex. I., XVIII., f. 4, *Bombyx.*
1816—Hübn., Verzeichniss, 184, *Cycnia.*

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1825—Hübn., Zutraege, 203, ff. 405, 406, *Cycnia.*
1837—Westw., ed. Dru., I., 34, *Spilosoma.*
1856—Wlk., C. B. Mus., Lep. Het., III., 669, *Spilosoma.*
1856—Fitch.*, 3rd Rept. Ins., N.Y., 384, *Hyphantria.*
1860—Clem, Proc. Ac. Nat. Sci., Phil., XII., 531, *Hyphantria.*
1862—Clem., in Morris Syn., 352, *Hyphantria.*
1862—Morris, Synopsis, 343, *Spilosoma.*
1865—Wlk., C. B. Mus., Lep. Het., XXXII., 352, *Hyphantria.*
1873—Stretch*, Zyg. & Bomb., 205, pl. VIII., ff. 18-20, *Hyphantria.*
1875—Butler, Cist. Ent., II., 32, *Hyphantria.*
1881—Graef., Bull. Bkln. Ent. Soc., III., 14, *Spilosoma.*
1881—French, Bull. Bkln. Ent. Soc., III., 31, *Spilosoma.*
1887—Riley*, Bull. X., Div. Ent., U. S. Dept. Agl., *Hyphantria.*

H. punctatissima A. & S.

1797—Abb. & Sm.*, Ins. Ga., II., 139, pl. 70, *Phalæna.*
1825—Hübner, Zutraege, 203, *pr. syn.*
1837—Westw., ed. Drury, I., 34, *pr. syn.*
1841—Harris*, Rept. Ins., Mass., 255, *Hyphantria.*
1862—Harris*, Inj. Ins., 358, *Hyphantria.*
1862—Morris, note to Harris, l.c., *pr. syn.*
1871—Saund.*, CAN. ENT., III., 36, *Hyphantria.*
1881—Graef., Bull. Bkln., Ent. Soc., III., 14, *pr. syn.*

H. congrua Wlk.

1856—Wlk., C. B. Mus., Het., III., 669, *Spilosoma.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 532, *Spilosoma.*
1862—Morris, Synopsis, Supplt., 343, *Spilosoma.*
1868—Grt. & Rob., Trans. Am. Ent. Soc., II., 72, *Spilosoma.*
1873—Stretch, Zyg. & Bomb., 130, *Spilosoma.*
1875—Butler, Cist. Ent., II., 33, =*cunea.*
1883—Grt.‡, CAN. ENT., XV., 9, *Spilosoma.*
1889—Smith, Ent. Amer., V., 121, =*cunea.*

H. punctata Fitch.

1856—Fitch, 3rd Rept. Ins., N. Y., 387, *Hyphantria.*
1862—Morris, Synopsis, Supplt., 344, *Spilosoma.*
1874—Stretch, Zyg. & Bomb., 204, *Hyphantria.*
1875—Butler, Cist. Ent., II., 33, *pr. syn.*

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1881—Graef, Bull. Bkln. Ent. Soc., III., 14, *pr. syn.*
1881—French, Bull. Bkln. Ent. Soc., III., 31, *pr. syn.*

H. textor Harris

1828—Harris*, New Engl. Farmer, VII., 33, *Arctia.*
1833—Harris, Cat. Ins. Mass., 591, *Arctia.*
1841—Harris*, Rept. Ins. Mass., 255, *Hyphantria.*
1856—Fitch*, 3rd Rept. Ins., N. Y., 387, *Hyphantria.*
1856—Wlk., C. B. Mus., Lep. Het., IV., 834, *Euproctis.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 530, *Hyphantria.*
1862—Morris, Synopsis Supplt., 344, *Spilosoma.*
1862—Harris*, Inj. Ins., 358, pl. VII., ff. 10–12, *Hyphantria.*
1862—Morris, in Harris l. c. note, *Spilosoma.*
1865—Walk., C. B. Mus., Lep. Het., XXXII., 351, *Hypantria.*
1870—Riley*, Am. Ent., I., 59, *Hyphantria.*
1871—Riley*, 3rd Rept. Ins., Mo., 130, f. 55, *Hyphantria.*
1871—Walsh*, 2nd Rept. Ins., Ills., 18, *Hyphantria.*
1871—Saund.*, CAN. ENT., III., 69, *Hyphantria.*
1873—Stretch*, Zyg. & Bomb., 206, pl. VIII., f. 21 (♂), *Hyphantria.*
1875—Edw.*, Proc. Cal. Ac. Sci., VI., 187, *Hyphantria.*
1875—Butler, Cist. Ent., II., 33, *Hyphantria.*
1881—Johnson*, CAN. ENT., XII., 18, *Hyphantria.*
1881—Graef, Bull. Bkln. Ent. Soc., III., 14, = *cunea.*
1881—French, Bull. Bkln. Ent. Soc., III., 31, = *cunea.*
1881—Riley, Gen. Index to Mo. Reports, 55, = *cunea.*
1883—Saund.*, Fruit Insects, 71, ff. 66–68, *Hyphantria.*
1888—Dimmock*, A. K., Psyche, IV., 280, *Hyphantria.*

H. candida Wlk.

1864—Wlk., C. B. Mus., Lep. Het., XXXI., 291, *Spilosoma.*
1868—Grt. & Rob., Trans. Am. Ent. Soc., II., 84, *pr. syn.*
1875—Butler, Cist. Ent., II., 33, *an sp. dist?*
Habitat—United States and Canada.

An elaborate list of food plants is given in Bull. X. of the Division of Entomology, U. S. Dept. of Agriculture, to which reference is made above. The synonymy is the generally accepted one, except as to *congrua*, which is added for the first time. In Mr. Grote's list of 1882, *textor* and *punctata* stand without number but in Roman letters, and therefore not as synonyms. There is no doubt at all of the identity of all

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these forms. Prof. Riley has proved that to demonstration, if proof were required to the statements of earlier writers.

Genus EUPSEUDOSOMA Grt.

1865—Grt., Proc. Ent. Soc., Phil., 240.

This genus I do not know autoptically. Mr. Grote, describing a male, gives the character, from which the following notes are made: Body stout; finely scaled, squammation close and short; head prominent, eyes large; tongue moderate, palpi finely scaled, not exceeding the front; legs rather stout, finely scaled, provided with minute spurs; antennæ long, biserrate, tapering to the tips, the serrations short, acute and rather distant; primaries large, triangulate, apices produced, costa very straight, external margin oblique; discal cell open; veins 3, 4 and 5 very nearly from one point, 2 not greatly removed from 3.

Unfortunately, Mr. Grote does not describe the arrangement of the costal series, but it is probably not different from *Spilosoma*. The venation of the secondaries is not described. Our only described species is: *E. floridum* Grt.

1882—Grt., CAN. ENT., XIV., 187, *Eupseudosoma*.

Habitat—Florida.

Said to be closely allied to the Cuban *E. niveum*.

Genus EUCHAETES Harris.

1841—Harris, Rept. Ins., Mass., 257.

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 532.

1862—Harris, Inj. Insects, 360.

1873—Stretch, Zyg. & Bomb., 185, *syn. spec.*

1882—Grt., CAN. ENT., XIV., 196, *syn. spec.*

Pygarctia Grt.

1871—Grt., CAN. ENT., III., 124.

Head moderate or rather large, closely applied to the thorax; eyes large, but not prominent. Palpi slender, not exceeding the middle of the front; third joint moderate. Tongue long, corneous. Antennæ long, in the ♂ rather lengthily bipectinated. Legs with rather close vestiture, posterior but little the longer, spurs normal. Vestiture hairy, but rather close. Abdomen exceeding secondaries, cylindric, obtusely terminated.

Primaries with 10 out of the subcostal before the end, 7 to 9 on the

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same stalk, 8 and 9 dividing just before the apex; 6 out of the same point with the stalk bearing 7–9; 3, 4 and 5 close together from the end of the median.

Secondaries: Subcostal rather long, forking to give rise to 6 and 7 unusually close to apex; costal very short from the subcostal beyond its middle; 3, 4 and 5 very close together out of the end of the median.

These studies were made on *E. egle.* In Mr. Grote's paper on the genus in CAN. ENT., XIV., 196, is an excellent table of the species at that time known, which renders their recognition easy. Several have been since described. From what we know of the early history of some of the species, dimorphism occurs in the genus, and some of the described forms may yet prove synonyms.

E. abdominalis Grt.

1871—Grt., CAN. ENT., III., 124, *Pygarctia.*
1873—Grt., Buff. Bull., I., 34, *Pygarctia.*
1882—Grt., Papilio, II., 111, *Euchaetes.*
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*
Habitat—Alabama.

E. bolteri Stretch.

1885—Stretch, Ent. Amer., I., 106, *Euchaetes.*
Habitat—Texas.

E. collaris Fitch.

1856—Fitch, 3rd Rept. Ins., N. Y., 265, *Hyphantria.*
1862—Morris, Synopsis, 344, *Spilosoma.*
1864—Pack., Proc. Ent. Soc., Phil., III., 130, =*egle.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 75, =*egle.*
1873—Stretch, Zyg. & Bomb., 188, pl. 8, f. 5 ♂, *Euchaetes.*
1874—Lint.*, Ent. Cont., III., 146, *Euchaetes.*
1877—Van. Wag.*, CAN. ENT., IX., 171, *life hist.*
1880—Jewett*, CAN. ENT., XII., 228, *Euchaetes.*
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*
1883—Edw.*, Papilio, III., 146, *Euchaetes.*

E. antica Wlk.

1857—Wlk., C. B. Mus., Lep. Het., VII., 1745, *Canada.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 75, =*egle.*
1873—Stretch, Zyg. & Bomb., 188, *pr. syn.*
1875—Butler, Cist. Ent., II., 37, *pr. syn.*

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E. sciurus Bdv.

1868—Bdv., Lep. Calif. (Ann. Soc. Ent., Belg., XII.), 79, *Arctia.*
1869—Grt. & Rob., Tr. Am. Ent. Soc., III., 174, =*L. acræa.*
1873—Stretch, Zyg. & Bomb., 188, =*collaris.*
1875—Butler, Cist. Ent., II., 37, =*collaris.*
Habitat—Canada, New York, Ohio, California.
Food plant—Apocynum androsæmifolium, and Asclepias sp.

E. egle Drury.

1773—Dru., Exot. II., pl. XX., f. 3, *Bombyx.*
1837—Westw., ed. Drury, II., 38, *Spilosoma.*
1841—Harris*, Rept. Ins., Mass., 257, *Euchaetes.*
1856—Wlk., C. B. Mus., Lep. Het., III., 669, *Spilosoma.*
1860—Clem., Pr. Ac. Nat. Sci., Phil., XII., 352, *Euchaetes.*
1862—Harris*, Inj. Ins., 359, ff. 172–174, *life hist.*
1862—Morris, Synopsis, 343, *Spilosoma.*
1862—Clem., in App. to Morris, 352, *Euchaetes.*
1869—Harris*, Ent. Corresp., 288, pl. 2, f. 5, (larva), *Euchaetes.*
1872—Strk., Lep. Rhop et. Het., I., 3, *Euchaetes.*
1872—Lint.*, Ent. Cont., II., 136, *Euchaetes.*
1873—Stretch, Zyg. & Bomb., 186, pl. 8, f. 4, *Euchaetes.*
1874—Pack., Rept. Geol. Surv., 1874, 558, *Euchaetes.*
1880—Andrews*, Psyche II., 271, *Euchaetes.*
1880—Jewett, CAN. ENT., XII., 230, *life hist.*
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*
1883—Hy. Edw.*, Papilio, III., 147, *Euchaetes.*
1884—French*, CAN. ENT., XVI., 221, *Euchaetes.*
Habitat—New York, New Jersey, Mass., Maine, Ills., Colorado, Canada.
Food plant—Asclepias cornutus, etc.

E. eglenensis Clem.

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 533, *Euchaetes.*
1875—Butler, Cist. Ent., II., 37, ? =*egle.*
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*
1882—Grt., Papilio, II., 111, *Euchaetes.*
1883—Hy. Edw.*, Papilio, III., 147, *Euchaetes.*
Habitat—Texas.
Food plant—Asclepias sp.

(To be continued.)

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A MONTH ON VANCOUVER ISLAND.

BY H. F. WICKHAM, IOWA CITY, IOWA.

But little seems to have been written on the fauna of this interesting island, and therefore I hope that a few notes bearing on the subject may not be without interest to the readers of the CANADIAN ENTOMOLOGIST. It was my good fortune to spend nearly a month in the vicinity of Victoria last summer, and I append some account of observations made at the time.

The Cicindelidæ are represented only by two species of *Omus* and by *Cicindela oregona*, the latter flying on the beach. *Omus audouinii* also frequents the beach, hiding under logs high enough up to be out of the the way of the water, while *O. dejeanii* dwells in the woods, and may be found under damp logs.

Two species of *Cychrus—angusticollis* and *marginatus*—are found in the heavy forest, and may be dug out of very rotten logs, or found in hollow roots of trees. They both seem to be rather common in places, as I dug over fifty *angusticollis* and a number of *marginatus* out of a single log. The former species emits a very strong and unpleasant odor when disturbed by handling.

Carabus oregonensis seems to prefer rather more open spots, and I took it mostly in the lanes around the outskirts of the town. These specimens are larger than those from Oregon and Washington, and have lighter colored elytra—resembling a specimen shown to me as coming from Sitka. Many other Carabidæ are common, especially *Blethisa*, *Notiophilus*, *Leistus*, *Nebria* and *Bembidium*.

Seashore collecting yields a rich return here, and nearly every log thrown up by the waves out of reach of the tides has its colony of beetles underneath. They are of various species and represent nearly all the large families, though, perhaps, Staphylinidæ are the most abundant. The large *Hadrotes crassus* may be seen under any log or bunch of kelp, which is damp enough to suit. Then we see *Cafius* represented by three species and numerous specimens of a little *Aleochara*, these living mostly in seaweed, along with *Cercyon fimbriatum*, a widely distributed species which I found in plenty at San Diego. The little Trichopterygid with the formidable name—*Motschulskium sinuatocolle*—may be seen on the under surface of logs on the beach, and the omnipresent *Dermestes* looks out for whatever the sea may give up of its dead.

Occasionally a good *Elaterid* is found. I got my only specimen of

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Corymbites carbo on the beach, and in dead wood *Hadrobregmus gibbicollis* makes its burrows. The curious little Malachiid known as *Endeodes collaris* runs on the salt sand, and an occasional *Ceruchus* may be seen under the drift.

I found no maritime Chrysomelids, but the Tenebrionidæ furnish an *Eleodes* and a *Coniontis* together with an occasional *Phaleria. Anthicidæ* were rare here, though common further south, but in the Rhyncophora some very interesting species were found.

In this group I found *Agasphærops nigra* and *Amnesia decorata* both on the beach, and once came across a little colony of *Emphyastes fucicola*, one of the most curious looking weevils I have ever seen. The testaceous color of this species seems to be shared by a great many others, which are strictly confined to a life on the beach. *Elassoptes marinus* is common under logs, boring in them from the lower surface, in company with a species of *Rhyncholus.*

Just back of the beach, near the park, is a nearly level space overgrown with various plants, a large majority of which are leguminous, and in the pods of these breed *Apion antennatum* and a species of *Bruchus.* With a sweep net vast numbers of these may be taken, along with numerous individuals of a species of *Ceutorhynchus.* In the lanes the sweep net may be used to great advantage, and some good species are certain to be taken—mostly Elateridæ in June, the month in which my work was done. These Elaterids form one of the most striking features in the fauna of the island, and are numerous both in species and individuals. *Corymbites* and *Athous* seemed the most plentiful of the larger forms, while *Dolopius* and *Megapenthes* represented the smaller.

Serica anthracina and *Odontæus obesus* were the only Scarabæids of note that I found, and these both, but rarely *Lepturæ* were the commonest longhorns, though a few others came to hand in beating: *Eumichthus œdipus* on flowers, *Molorchus longicollis* and *Xylotrechus annosus* on willows.

Chysomelidæ are also rather backward in showing themselves. I took only one *Donacia* by careful search, and the only Cryptocephalids seem to be *Diachus auratus* and *D. catarius.* I took *D. auratus* in the mountains of Arizona in 1888 and have *D. catarius* from Michigan, so these forms are both very widely distributed. *Plagiodera oviformis* occurs on low ground with *Prasocuris vittata* and the familiar green of *Crepidodera helxines* shines on the willows.

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In the meadows I found a few specimens of *Epicauta puncticollis*, but that was all I saw of the Meloidæ. We could hardly expect to find many of them so far north however.

Having a love for Rhyncophora I took pains to get as large a series as possible, and was rewarded by finding quite a number of species. *Rhynchites bicolor* lives on roses there, as I believe it does everywhere in North America, in fact I doubt if there is a spot on this continent where roses grow, that *Rhynchites bicolor* does not inhabit too. Besides *A. nigra* and *A. decorata* previously mentioned, other species of Otiorhynchids may be found, and of these *Amnesia granicollis* and *Sciopithes obscurus* are the most plentiful. The former is found in moss or around the roots of grass under logs, while the latter lives on various bushes, preferring blackberry, I think. In company with the *Amnesia* may be found large numbers of a species of *Sitones*, which may some day require the attention of the economist. The injury done to the roots of grass by this little beetle must, I think, be considerable.

I took one *Plinthodes taeniatus* from a rotten log, and two or three *Trichalophus didymus* on low ground among a lot of willows. *Apion* has already been spoken of, *Lepyrus* is common on willow with *Dorytomus brevicollis*, *D. mannerheimii*, *Magdalis salicis* and *Orchestes niger*.

Sweeping in a field yielded a fine specimen of *Trachodes quadrituberculatus*, one of *Phytonomus setigerus* and two or three of a new *Anthonomus*. *Ceutorhynchus* furnished two or three species, *Pelenomus* one, and *Phytobius* one, probably *P. velatus* Beck, a very interesting species of wide distribution, occurring in Michigan and Illinois as well as in Europe. I found no signs of *Centrini* and no *Sphenophorus*. The Scolytidæ taken were all of two species—*Scolytus unispinosus* and *Hylesinus aspericollis*.

There seems to be a preference among water-beetles for small bodies of water, and often after sifting the waters at the edge of a lake or stream with little or no success, I have thoroughly cleaned out a little spring or puddle and found it swarming with them. This experience, repeated so often before, was gone through again at Victoria and I made quite a collection of aquatics in the course of a couple of hours. The species were few in number—not over twenty probably—but there were a good many examples of some of them. The genera *Bidessus*, *Deronectes*, *Agabus*, *Dytiscus*, *Helophorus*, and *Hydrobius* hold the bulk of the species.

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Before closing I wish to speak of the results of sifting, a method of collecting which is sadly neglected by many collectors, but which yields some of the rarest and most interesting species. I had expected a good deal of material to result from the use of the sieve here and was not disappointed. Putting in a good-sized bundle of moss and rubbish I shake it over a white cloth and out tumble the beetles faster than I can take care of them—little Staphylinidæ in abundance, now and then a *Tychus cognatus* or *Batrisus zephyrinus*, dozens of *Cyphon exiguus* and single specimens of various kinds. Once in a while some weevil falls out or a *Simplocaria*, *Bembidium* is racing around the cloth, and so are the little —almost invisible—Trichopterygidæ, in which the fauna of the Island is rich. Many Latridiidæ also fall through the wires.

I would recommend this Island as a fine field for investigation by any Entomologist who wishes to spend his summer in a spot charming in itself and rich in insect life. While the fauna of the Island is in some degree marked by one of the peculiarities of the Pacific coast—i. e. a less number of species occupying a given small area than is the case in the East—there are enough to keep one always happy by finding something new or of interest, and material from this region is in good demand among students of our North American fauna, therefore duplicates find a ready exchange. My own work was done mostly in the Coleoptera, but insects of other orders seemed to be plentiful, with the exception of Lepidoptera. There may be more of these however at other seasons of the year.

THE ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO

will be held in the rooms of the Society, at London, on Wednesday, August 27th, at 9.30 a. m.

THE ENTOMOLOGICAL CLUB OF THE A. A. A. S.

will meet in a room to be assigned by the local committee in the Capitol building at Indianapolis, Indiana, Wednesday, August 20th, at 9 a.m., when members will register and obtain the Club badge. Members intending to contribute papers will send the titles to the President, Prof. A. J. Cook, Agricultural College, Michigan, or F. M. Webster, Lafayette, Ind. It is to be hoped that members will contribute freely, not only to the proceedings of the Club, but also to those of Section "F".

F. M. WEBSTER, Sec. Ent. Club A. A. A. S.

Mailed August 6th.

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The Canadian Entomologist.

VOL. XXII. LONDON, SEPTEMBER, 1890. No. 9.

A SUGGESTION AS TO THE GENERIC NOMENCLATURE OF INSECTS.

BY T. D. A. COCKERELL, LONDON, ENGLAND.

Mr. Scudder's recent admirable work on the butterflies of New England has, naturally enough, given rise to fresh discussion of the question of generic nomenclature, without, however, leading to any very decisive result. Mr. Scudder's views on the sub-division of hitherto-accepted generic units are certainly extreme, and probably few will be found to follow him entirely. On the other hand, many no doubt feel that Mr. W. H. Edwards's genera require some sort of sub-division, and would compromise matters by admitting some, and rejecting others, of Mr. Scudder's divisions. Mr. Edwards himself, in his 1884 catalogue, has numbered sub-divisions of many larger genera; thus of *Lycæna* we get groups I. to VII. But these numbers are not adopted by others, partly because different authors treat the subject differently, thus creating confusion, and partly because it is not easy or convenient to use a number instead of a name.

So we come to this conclusion: It is necessary that the larger genera should be sub-divided, but it is highly unadvisable to call all those sub-divisions genera. We therefore need a system of section or group-names which shall be uniform, used generally,—not, like the numbers, variable according to the fancy of the author,—and yet not of the nature of genera or sub-genera.

In the treatment of *Carex* by the botanists I think we see a similar problem solved. *Carex* is a huge genus, which even after a reasonable amount of subgeneric division, needs further grouping to be made intelligible. So, Fries, Drejer, Tuckerman and others have proposed section-names: *Flexiles*, *Paniceæ*, *Sigitatæ*, etc. These names are always in the plural, and have nothing to do with sub-genera or genera properly speaking, nor does any trouble arise about priority, provided the name has not been used before in the same genus. The groups may not

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be all of equal value, and there are sections again sub-divided into sections. This system is not new, and I believe it to be very useful, allowing us to recognize the natural sub-divisions of genera, without being obliged to make genera of them. I have already adopted these section-names in a list of North American land-shells now ready for printing, and have thereby been able to reduce the number of so-called sub-genera without refusing to notice the natural groups they represent. I derived my section-names when convenient from a prominent species of the group, or in other cases, by adopting a descriptive term, or turning a sub-generic name into a plural section-name.

Before writing this paper, I wrote to Mr. W. H. Edwards, telling him of my idea for getting out of the present difficulty. He comments favourably on the suggestion, and writing of Mr. Scudder's "genera," made by sub-division of *Colias*, etc., he says: "I consider them groups merely, or sub-groups. All *Anthocharis*, I think, should be one [genus], all *Argynnis* one, all *Colias* one. If numbers can't be accepted, I am perfectly willing to try the section-names as you suggest * * *. By-and-by I propose to give a new edition of my catalogue, and then I may adopt the plan throughout. It would save us from fifty genera in *Pamphila* at once." (*in litt.*, May 17, 1890.)

Should Mr. Edwards decide to adopt section-names, we can hardly do better than leave him to decide about the sections and choose appropriate names; but to illustrate the point I will here treat a few "genera" as proposed:—

W. H. Edwards.	Scudder.	Proposed Section-Name.
Papilio, group V.	Jasoniades.	Turni.
Colias, group I.	Zerene.	Cæsoniæ.
Vanessa, pars.	Euvanessa.	Antiopæ.
Pamphila, group II., pars.	Erynnis.	Erynnes.
Thecla, group IV., pars.	Incisalia.	Incisaliæ.
Lycæna, group V.	Rusticus.	Rustici.
Chrysophanus, group III.	Heodes.	Chrysophanuli.

As will be seen, the first three names are taken from prominent species: the second three from the so-called genera, and the last from a character of the group. It may be found advisable, at least as often as possible, to adopt the name from a species; but some specific names, as *poweschiek*, *pawnee*, etc., would be rather difficult to render plural, not to

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speak of the objection to increasing the use (as section-names) of such extraordinary appellations. The plural termination, I should think, ought always to be Latinised.

The same principle may, of course, be applied to other groups of insects. Such genera as *Agrotis*, *Pterostichus*, *Tipula*, *Bombus*, etc., might be well sectionised.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 168, Volume xxii.)

E. elegans Str.

1873—Stretch, Zyg. & Bomb., 189, pl. 8, f. 6, *Euchaetes.*

1875—Butler, Cist. Ent., II., 37, *Euchaetes.*

1876—Stretch, Wheeler's Rept. Surv., west 100 mer., V., 797, pl. 40, ff. 5 and 6, *Euchaetes.*

1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*

Habitat—California, Owens Valley.

E. immaculata Graef.

1887—Graef., Ent. Amer., III., 42, *Euchaetes.*

Habitat—Florida.

E. inopinatus Hy. Edw.

1882—Edw., Papilio, II., 13, *Euchaetes.*

Habitat—Florida.

E. murina Stretch.

1885—Stretch, Ent. Amer., I., 106, *Euchaetes.*

1887—Graef., Ent. Amer., III., 142, *Euchaetes.*

Habitat—Arizona, Texas.

E. oregonensis Stretch.

1873—Stretch, Zyg. & Bomb., 187, pl. 8, f. 7, *Euchaetes.*

1874—Lint.*, Ent. Cont., III., 145, *Euchaetes.*

Habitat—Oregon, Texas, New York.

E. perlevis Grt.

1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*

1882—Grt., Papilio, II., 131. *Euchaetes.*

Habitat—Arizona.

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E. pudens Hy. Edw.

1882—Edw., Papilio, II., 126, *Euchaetes.*
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*
Habitat—Texas.

E. scepsiformis Graef.

1887—Graef, Ent. Amer., III., 43, *Euchaetes.*
Habitat—Texas.

E. spraguei Grt.

1875—Grt., CAN. ENT., VII., 200, *Euchaetes.*
1877—Grt., CAN. ENT., IX., 85, *Euchaetes.*
1882—Grt., Papilio, II., 111, *Euchaetes.*
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*
Habitat—Kansas, Texas.

E. vivida Grt.

1882—Grt., Papilio, II., 131, *Euchaetes.*
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*
Habitat--South-western Texas.

E. yosemite Hy. Edw.

1883—Edw., Papilio, III., 146, *Euchaetes.*
Habitat—San Jose Valley, California.

E. zonalis Grt.

1882—Grt., Papilio, II., 131, *Euchaetes.*
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*
Habitat—Arizona.

The genus *Vanessodes* G. & R., which Mr. Grote inserts in this place seems to be a *Lithosian.* I cannot demonstrate ocelli in any specimens I have examined. The venation and habitus is also Lithosiform rather than *Arctiid.*

Genus ARACHNIS Hbn.

1837—Hübner, Zutræge, 457.
1873—Stretch, Zyg. & Bomb., 83.

Head very small, retracted; palpi small; tongue short and weak, not longer than the head. Legs short and stout; tibiæ with the spurs normal in number, but very short.

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Primaries with 7 to 10 on a stalk, 10 branching a very short distance from the end of the subcostal, 7 to 9 branching rather beyond the middle of the common vein ; 3, 4 and 5 almost equidistant from the end of the median.

Secondaries with 6 and 7 forking from the subcostal slightly before the end of the cell ; 3, 4 and 5 very close together from the end of the median.

The antennæ are simple in both sexes, and the tarsal claws are also simple.

A. picta Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 126, *Arachnis.*
1873—Stretch*, Zyg. & Bomb., 83, pl. 3, f. 6, ? = *aulæa.*
1876—Moeschl., Stett. Ent. Zeit., XXXVII., 298, *Arachnis.*
Habitat—California, Colorado.
Food plant—Lupinus sp.

A. aulæa Geyer.

1837—Geyer, Zutraege, 913, 914, *Arachnis.*
1860—Clem , Proc. Ac. N. Sci., Phil., XII., 526, *Arachnis.*
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 78, *Ecpantheria.*
1873—Stretch, Zyg. & Bomb., 86, *Arachnis.*
1876—Moeschler, Stett. Ent. Zeit., XXXVII., 298, *Arachnis.*
incarnata Wlk.
1855—Wlk., C. B. Mus., Lep. Het., III., 690, *Ecpantheria.*
1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 524, *Ecpantheria.*
1865—Wlk., C. B. Mus., Lep. Het., XXXI., 300, *pr. syn.*
Habitat—California, Mexico.

Whether we have here to do with one or two species is a question ? Packard, in describing his species, does not refer to *aulæa* at all. Moeschler says the difference between the two is that in *picta* the costal margin of primaries beneath is yellow, whereas in *aulæa* it is red. Whether or not the Mexican form is different from the Californian examples must be settled by those who have the material. All the California specimens I have ever seen refer to the *picta* variety.

Genus Euerythra Harv.

1876—Can. Ent., VIII., 5.
1887—Smith, Proc. U. S. Nat. Mus., X., 335.

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Head moderate in size, scarcely retracted ; tongue weak ; palpi small, longer in the ♀. Antennæ of ♂ bipectinated, of the ♀ simple. Legs almost equal in length, spurs normal in number but short.

Primaries with 7 to 10 stalked, out of the same point with 6 from the end of the subcostal ; 3, 4 and 5 from the end of the median, 4 more remote from 3 than from 5.

Secondaries without costal vein, subcostal extended some little distance beyond the end of the cell and forking to give off 6 and 7 ; 3, 4 and 5 from the end of the median, 5 rather more remote from 4 than is 3.

For further details I would refer the student to my paper in Proc. U. S. Nat. Mus., X., 335.

E. phasma Harv.

1876—Harv., CAN. ENT , VIII., 5, *Euerythra.*

1887—Smith, Proc. U. S. Nat. Mus., X., 336, *Euerythra.*

Habitat—Texas.

E. trimaculata Smith.

1887—Smith, Ent. Amer., III., 17, *Euerythra.*

1887—Smith, Proc. U. S. Nat. Mus., X., 336, *Euerythra.*

Habitat—Texas.

The two species are closely allied, but are, I believe, distinct.

Genus ECPANTHERIA Hbn.

1816—Hübner, Verzeichniss, 183.

1855—Walker, C. B. Mus., Lep. Het., III., 668.

1862—Morris, Synopsis, 347.

1873—Stretch, Zyg. & Bomb., 174.

Tongue very short and weak. Legs short and stout, subequal in length ; middle and posterior tibiæ with minute terminal spurs only. Tarsi short, the claws split nearly to the base in both sexes. Antennæ of the male serrate, of the female simple.

Primaries with 6 to 10 stalked out of the end of the subcostal, 6 branching off almost immediately, 10 a little further on, 7 more than half way to apex, while 8 and 9 divide just before the apex ; 3, 4 and 5 from the end of the median, 4 nearer to 5 than to 3.

Secondaries with 8 from the subcostal unusually close to base ; 6 and

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7 from the same point at the end of the subcostal ; 4 and 5 from the same point at end of median, 3 very close to the same source.

The wing form of the genera has not been described very generally in these notes, but in this genus it may be added that the secondaries are disproportionately small and tend to become caudate.

E. permaculata Pack.

1872—Pack., 4th Rept. Peab. Ac. Sci., 86, *Leucarctia.*

reducta Grt.

1877—Grt., Bull. U. S. Geol. Surv., III., 799, *Ecpantheria.*

1887—Bruce, Ent. Amer., III., 14, *Ecpantheria.*

cæca Strk.

1884—Strk., Proc. Ac. Nat. Sci., Phil., XXXVI., 283, *Ecpantheria.*

Habitat—Colorado, Arizona, So. California.

Dr. Packard's term *permaculata* seems to have become lost in some way. It is not referred to in Mr. Grote's list, and Mr. Edwards does not mention it in his additions in Ent. Amer., III. It refers without doubt to the *reducta* of Grote. Mr. Bruce has taken it quite abundantly in Colorado.

E. scribonia Stoll.

1787—Stoll*, Sup. to Cramer's Pap. Ex., f. 177, pl. 41, f. 3, *Phalæna.*

1816—Hbn., Verzeichniss, 183, *Ecpantheria.*

1825—Hbn., Samml. Ex. Schmett., pl. 403, *Ecpantheria.*

1855—Wlk., C. B. Mus., Lep. Het., III., 689, *Ecpantheria.*

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 523, *Ecpantheria*

1862—Harris*, Injurious Insects, 349, *Ecpantheria.*

1862—Clem., App. to Morris, Syn., 347, *Ecpantheria.*

1863—Saund.*, Proc. Ent. Soc., Phil., II., 28, *Ecpantheria.*

1863—Saund.*, Syn. Can. Arct., 22, *Ecpantheria.*

1864—Pack., Proc. Ent. Soc , Phil., III., 127, *Ecpantheria.*

1868—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 78, *Ecpantheria.*

1872—Riley*, 4th Rept. Ins. Mo., 141, ff. 63, 64, *Ecpantheria.*

1873—Stretch*, Zyg. & Bomb., 174, pl. 7, ff. 20 (♂) and 21 (♀), *Ecpantheria.*

1882—Saund*, Can. Ent., XIV., 113, f. 12 and 13, *Ecpantheria.*

1888—Slosson, Ent. Amer., III., 185, *Ecpantheria.*

oculana Fabr.

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1775—Fabr., Syst. Ent., 564, *Bombyx.*
1781—Fabr., Sp. Ins., II., 177, *Bombyx.*
1787—Fabr., Mant. Ins., II., 112, *Bombyx.*
1791—Oliv., Enc. Meth., V., 44, *Bombyx.*
1793—Fabr., Ent. Syst., III., 1, 425, *Bombyx.*
1797—Sm. Abb., Ins. Ga., II., 137, *Phalæna oculatissima.*
1855—Wlk., C. B. Mus., Lep. Het., III., 689, *pr. syn.*
oculatissima Sm. Abb.
1797—Sm. Abb*, Ins. Ga., II., 137, pl. 69, *Phalæna.*
1841—Duncan, Nat. Libr., XXXII., pl. 30, f. 4.
1864—Pack., Proc. Ent. Soc., Phil., III., 127, *pr. syn.*
cunegunda Cramer.
1782—Cram., Pap. Exot., IV., 104, pl. 344, f. D. E., *Phalæna.*
1805—DeB., Ins. Afr. et. Am., 134, pl. 24, f. 4, *Bombyx.*
1865—Grt. & Rob., Ann. Lyc., N. Y., VIII., 368, *pr. syn.*
var. *denudata* Slosson.
1888—Slosson, Ent. Amer., III., 212, *Ecpantheria.*
Habitat—Canada to Florida, to Texas, to California.
Food plant—Omnivorous.

I do not see why the term *oculana* Fabr. should not be restored for this species, but do not make the substitution lest there be some reason I have not yet discovered, to prevent it. Walker makes the reference, but retains the later name. Packard cites Walker, but does not refer at all to *oculana*, although *oculatissima* is referred to in the synonymy. Smith and Abbot refer to *oculana* as identical with their form, and also cite Cramer's figure of *cunegunda*, which also antedates *scribonia.*

E. sennettii Lint.
1884—Lintner, Papilio, IV., 147, *Ecpantheria.*
Habitat—Texas.

Genus NELPHE Boisd.

I do not know this genus at all, either autoptically or by description. The only described American species is :

N. carolina Hy. Edw.
1886—Edw., Ent. Amer., II., 166, *Nelphe.*

(To be continued.)

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NOTES ON ARGYNNIS FREYA, CHARICLEA AND MONTINUS.

BY H. H. LYMAN, MONTREAL.

As is well known to readers of the CANADIAN ENTOMOLOGIST, Mr. Scudder, in his sumptuous work on the Butterflies of New England recently published, stated that Mr. Edwards had confused the two northern species, *Argynnis Freya* and *Chariclea*. This was denied by Mr. Edwards in the April number of this journal and Mr. Butler's authority was invoked to prove that Mr. Scudder had himself transposed these names. Here the matter rests, but as I think that I can throw some additional light on the question I shall endeavour to do so.

In the preface to Mr. Scudder's work he states that "twenty years ago the present work was definitely planned, announced and begun and the greater part of it has been written for fifteen years," though he adds that much of it was rewritten within the past few years.

On page X. of the same preface, in speaking of the appendix in which certain butterflies not found in New England are described, he says: "It was, however, an afterthought not entering into the original plan * * * * it has, indeed, been written during the printing of the work." This fact that the first volume was written fifteen or more years ago and the third only last year, no doubt explains the contradictory statements in reference to the affinities of *Argynnis Montinus* which appear in these volumes.

On page 604 of the first volume Mr. Scudder, in speaking of *A. Montinus*, says: "This species is certainly distinguishable from B. chariclea (Schneid), or B. chariclea boisduvalii (Somm.), both of which forms have been found by Mr. Couper on the northern shore of the Bay of St. Lawrence. Whether it should be looked upon merely as a geographical race, or as a species, is a question about which there may be easy difference." This certainly implies a very close connection between these forms, and in the original description of *Montinus*, in Scudder's "List of the Butterflies of New England," published in the Proceedings of the Essex Institute in April, 1863, reference to which he curiously enough omits from his recent work, he began his description with "Very similar to *A. Chariclea*."

So far so good, but on turning to the appendix in the third volume, page 1807, under the heading of *Brenthis freija* Thunb., which is the same as *Freya* Hübn., he says: "This species is very closely allied to

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B. Montinus." Now, these two statements are quite irreconcilable, for while it is quite true that some so-called species stand so close together that a third may be quite correctly described as very close to both, this is certainly not the case with the species in question, which are very distinct. I think it will therefore be conceded that Mr. Scudder is wrong in one of these statements, and we can therefore proceed to examine which is erroneous, and I believe it will be found that in this case second thoughts were not best.

Both *Chariclea* and *Freya* occur in Europe and have been studied and illustrated by European entomologists. *Freya*, or *Freija*, is figured and described in Boisduval's *Icones*, p. 100, pl. 19, fig. 4, 5, and in the same work there is a description and figure (p. 98, pl. 20, fig. 5, 6) of *A. Boisduvalii*, which all the authorities that I have been able to consult, with possibly one exception, concede to be but a variety of *Chariclea*. Both of these references were omitted by Kirby from his catalogue and the former was overlooked by both Edwards and Scudder, but both are given in Strecker's catalogue. The figures in Boisduval's work, though inferior to those to which Messrs. Edwards and Scudder have accustomed us, are still sufficiently accurate to prove that it is truly *Chariclea*, as stated by Mr. Scudder in his first volume, to which *A. Montinus* is allied.

Mr. Scudder also makes the mistake of giving, doubtfully it is true, *M. Tarquinius* Curtis as a synonym of *A. Boisduvalii*, while all the other authorities give it as a synonym of *Freya*. From its description in the appendix to the "Narrative of Sir John Ross," it must certainly be very close to *Freya*, and is probably identical with it, but it has no connection with *Chariclea* or its variety, *Boisduvalii*. It thus appears that Mr. Scudder must have confused these species, and so transposed their names, a very curious mistake, and apparently similar to that which he formerly made in regard to *Phyciodes Harrisii* and *Nycteis*, to which I called his attention in 1878.

As there are doubtless many readers of this journal who are not familiar with these northern species of *Argynnis*, a few descriptive notes may not be out of place.

Chariclea may be described as somewhat like *Myrina* upon the upper side, though the markings are heavier, especially upon the secondaries, and it is rather more deeply shaded at the bases of the wings. There is, however, a very striking difference in the fact that in *Chariclea* the cres-

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cent-shaped markings on the hind wings open outwards, while in *Myrina* they are much lighter and open inwards. There is, of course, no similarity between these species on the under side.

Freya is strikingly different from *Chariclea* upon both the upper and the under surfaces. Above the colour is duller and the bases of the wings are very heavily shaded; in fact, in the case of the secondaries, this shading extends over nearly the half of the wing. In *Chariclea* the black so-called mesial band is composed of a series of almost straight bars placed rather irregularly, while in *Freya* it is made up of a series of deep lunules. A like difference may be observed on the secondaries, but it is not quite so marked. On the under side of primaries similar differences are observable, although the markings are lighter; but the under side of secondaries show the most marked differences, for the beautiful band of pearly lunules crossing the wings just outside of the mesial black band in *Freya* has no counterpart in *Chariclea* and the course of the black band in its deep lunules is also very distinct.

There are many other points of difference between these species, but it is not very easy to indicate them clearly without going into a tedious description.

Mr. Scudder's descriptions of these species being reversed, what he says of *Freija* belongs really to *Chariclea*, and *vice versa*. These descriptions are given in great detail and are generally correct, but contain several curious errors. For instance, in describing the primaries of his *Freija*, but really *Chariclea*, he says: "Within the mesial band are three narrow transverse bands crossing the cell, the innermost not reaching the median nervure; within these is a small lunule opening outward." Surely he should have said inward, as the concave side of the lunule is towards the base of the wing. I might also allude to the fact that he says that the mesial band starts "a little beyond the middle of the costa"; as it really starts at a point very nearly two-thirds from the base of the wing I consider his statement rather loose for a man as particular as Mr. Scudder is known to be. Similarly in describing *Freya*, or *Freija*, he says that the black mesial band of primaries starts at the middle of the costa, while it is really not less than three-fifths from the base. In describing this form he omits to mention the small lunule inside the three bars crossing the cell, though it is recognizable, at least in my specimens, in spite of the heavy shading just inside of it, and he also fails to observe that the

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black mark below the first divarication of the median nervure is angulated in a similar manner to that in the other species. But the most curious statement is that which he makes in speaking of the underside of primaries, where he says that "the sagittate spots are more delicate, and the nervules beyond them are distinctly yellowish or white," whereas these yellowish or white lines are on the creases forming the centres of the interspaces and not on the nervules at all.

There are other slips in these two descriptions, but mention of these is sufficient to show that Mr. Scudder's descriptions, though laboured, are not always quite accurate. Mr. Scudder also speaks of these species as flying—one in May, or early in June, and the other late in August, or early in September. At Laggan, however, where my specimens were collected by Mr. Bean, the difference of seasons was not so marked, as *Freya* was obtained May 11th and 16th, and *Chariclea* June 29th to July 18th. The latter occurs, however, later than this, and is doubtless found up to the end of August.

ON THE LISTS OF COLEOPTERA PUBLISHED BY THE GEOLOGICAL SURVEY OF CANADA, 1842–1888.

BY W. HAGUE HARRINGTON, OTTAWA.

(Continued from page 160, Vol. xxii.)

SCARABÆIDÆ.

Onthophagus Hecate *Panz.* A.O., W., S.M.
Aphodius fossor *Linn.* St.L.
validus *Horn.* W.
fimetarius *Linn.* A.O., St.L., T.L.
ruricola *Melsh.* W.
fœtidus *Fab.* T.L.
pectoralis *Lec.* B.C.
granarius *Linn.* S.M.
leopardus *Horn.* Y.F., N.O., O.
Geotrupes Egeriei *Germ.* A.O.
Dichelonycha subvittata *Lec.* A.O., St.L.
Backii *Kirby.* B.C., M.
Serica tristis *Lec.* S.M.

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Diplotaxis brevicollis *Lec.* B.C.
Lachnosterna fusca *Fröh.* L'O., St.L., B.C., S.M.
Osmoderma eremicola *Knoch.* L'O.
scabra *Beauv.* A.O.
Trichius piger *Fab.* A.O.
affinis *Gory.* N.O., W., S.M., O.K.

SPONDYLIDÆ.

Spondylis upiformis *Mann.* B.C.

CERAMBYCIDÆ.

Orthosoma brunneum *Forst.* (unicolor *Drury).* L'O.
Asemum atrum *Esch.* B.C.
Criocephalus agrestis *Kirby.* N.C., Y.F., C.L., S.M, O., N., C.R.
Tetropium cinnamopterum *Kirby.* O.
Gonocallus collaris *Kirby.* C.R.
Hylotrupes ligneus *Fab.* [Physocnemum]. St.L., O.
Phymatodes dimidiatus *Kirby.* B.C.
Merium proteus *Kirby.* B.C., Y.F., N.O., C.L., O., N., C.C., C.R.
Xylotrechus undulatus *Say.* N.C., N.O., C.L., S.M., O , N., C.R.
Neoclytus muricatulus *Kirby* [leucozonus *Lap.*]. N.O.
Desmocerus palliatus *Forst.* S.M.
Encyclops cæruleus *Say.* A.O.
Rhagium lineatum *Oliv.* O.
Pachyta monticola *Rand* (Evodinus). A.O.
liturata *Kirby.* B.C., C.L., N.
Achmæops proteus *Kirby.* A.O., N.O., O., C.R.
pratensis *Laich.* N.C., N.O., S.M.
Leptura subargentata *Kirby.* B.C., N.C.
var. similis *Kirby.* N.O.
sexmaculata *Linn.* N.C., O., C.R.
nigrella *Say.* C.R.
canadensis *Fab.* A.O., O.K.
chrysocoma *Kirby.* N.C., S.M.
proxima *Say.* A.O.
vittata *Germ.* A.O.
pubera *Say.* A.O., S.M.

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mutabilis *Newm.* A.O.
aspera *Lec.* S.M.
Monohammus maculosus *Hald.* S.M.
scutellatus *Say.* A.O., St.L., N.C., Y.F., N.O., S.M., M., H.M., M.F., O.K., O., N., C.R.
race oregonensis *Lec.* B.C.
confusor *Kirby.* A.O., St.L.
marmorator *Kirby.* H.M.
Pogonocherus penicellatus *Lec.* H.M., O.K., O.
mixtus *Hald.* N.C.
Saperda vestita *Say.* L'O.
tridentata *Oliv.* A.O.

CHRYSOMELIDÆ.

Donacia pubicollis *Suffr.* O.K.
palmata *Oliv.* A.O.
hirticollis *Kirby.* C.L., M.F., N.
magnifica *Lec.* C.L., C.C.
proxima *Kirby.* N.O., C.L., M.F., C.C., R.A.
subtilis *Kunze.* A.O., C.L., H.M., C.C., R.A.
æqualis *Say.* O.K.
cuprea *Kirby* [pusilla *Say.*]. A.O., T.L., N.
aurea [? misprint for aurifer *Lec*, =*var.* cuprea]. M.F.
flavipes *Kirby.* A.O., T.L.
Orsodacna atra *Ahr.* [Childreni *Kirby*]. B.C., N.C.
Syneta ferruginea *Germ.* [tripla *Say*]. A.O., B.C.
Cryptocephalus 4-maculatus *Say.* C.C.
Adoxus obscurus *Linn.* [vitis *Fab.*]. A.O., B.C., N.C., O.K., N.
Chrysochus auratus *Fab.* A.O., S.M.
Graphops marcassita *Cr.* S M.
Entomoscelis adonidis *Fab.* B.C.
Prasocuris Phelandrii *Linn* [Helodes trivitta *Say*]. L'O.
varipes *Lec.* S.M.
Doryphora clivicollis *Kirby* [Chrysomela trimaculata *Fab.*]. L'O.
10-lineata *Say.* S.M.
Chrysomela scalaris *Lec.* A.O., St.L.
philadelphica *Linn.* S.M., T.L.

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var. spirææ *Say.* A.O., N.C.
multipunctata *Say*, *race* verrucosa *Suffr.* B.C.
Plagiodera oviformis *Lec.* B.C.
Gastroidea polygoni *Linn* [Gastrophysa]. W.
cyanea *Melsh* [Gastrophysa] W., N.
Lina lapponica *Linn* [Plagiodera interrupta *Fab.*]. A.O., B.C., C.L., O.K., C.R., *var.*
scripta *Fab.* O.K.
Gonioctena arctica *Mann.* N.C.
pallida *Linn* [rufipes *DeG.*]. B.C., Y.F., N.O., O., N.
Phyllodecta vitellinæ *Linn.* A.O.
Phyllobrotica decorata *Say.* A.O.
Galeruca sagittariæ *Gyll.* A.O., B.C. *? var.*, N.O., C.L., H.M., O.K., O., N., C.C.
Hypolampsis pilosa *Ill.* C.L.
Oedionychis lugens *Lec.* B.C.
scripta [? misprint for scripticollis *Say* =*var* vians *Ill.*]. C.L.
Disonycha collaris *Fab.* [Haltica]. L'O.
Haltica bimarginata *Say* [Graptodera]. B.C., N.C., N.O., M.F.
evicta *Lec.* [Graptodera]. B.C.
Crepidodera mancula *Lec.* B C.
Systena frontalis *Fab.* A.O.
Chelymorpha argus *Licht.* [cribraria *Fab.*]. L'O., W.

TENEBRIONIDÆ.

Phellopsis porcata *Lec.* B.C.
Coniontis ovata [? misprint for ovalis *Esch.*]. B.C.
Eleodes cordata *Esch.* B.C.
Nyctobates pennsylvanicus *DeG.* (Ipthimus). L'O.
Ipthimus opacus *Lec.* S.M.
Upis ceramboides *Linn.* (reticulatus *Say*). A.O., St.L., B.C., C.L., S.M., O.K., O., N., C.C., R.A.
Tenebrio molitor *Linn.* L'O , N.O., W., S.M.
tenebriodes *Beauv.* S.M.
Blapstinus moestus *Melsh.* S.M., H.M.
interruptus *Say.* S.M.
Hypophlœus punctatus [misprint ?]. B.C.
Boletotherus bifurcus *Fab.* (Bolitophagus cornutus *Pz.*). A.O.

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CISTELIDÆ.

Isomira quadristriata *Coup.* S.M.
Hymenorus pilosus *Melsh.* S.M.

LAGRIIDÆ.

Arthromacra ænea *Say.* S.M.

MELANDRYIDÆ.

Penthe obliquata *Fab.* M.F.
Serropalpus barbatus *Schall.* [substriatus *Hd.*]. St.L., O.
Stenotrachelus arctatus *Say.* N.C., M.F., O.

PYTHIDÆ.

Crymodes discicollis *Lec.* B.C.

CEPHALOIDÆ.

Cephaloon tenuicorne *Lec.* B.C.

MORDELLIDÆ.

Mordellistena vitis [? misprint for vilis *Lec.*]. B.C.
nigricans *Melsh.* A.O.

ANTHICIDÆ.

Corphyra lugubris *Say.* S.M.
collaris *Say.* (Pedilus). A.O.

MELOIDÆ.

Meloe angusticollis *Say* (rugipennis *Lec.*). A.O., St.L., N.
americanus *Leach.* N.C.
Macrobasis unicolor *Kirby.* S.M., O.K.
Cantharis cyanipennis *Say.* B.C.

OTIORHYNCHIDÆ.

Evotus naso *Lec.* B.C.

CURCULIONIDÆ.

Sitones flavescens *Marsh.* (lepidus *Gyll.*). A.O.
Trichalophus alternatus *Say.* B.C.
Lepyrus gemellus *Kirby.* N.
colon *Linn.* B.C., N.G.

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Pissodes strobi *Peck.* H.M.
costatus *Mann.* B.C.
dubius *Rand.* H.M.
Hylobius pales *Hbst.* A.O., S.M., O., C.R.
confusus *Kirby.* S.M.
Hypomolyx pineti *Fab.* [pinicola *Coup.*]. A.O. (near pineti), O., N., C.R.
Lixus caudifer *Lec.* B.C.
Dorytomus laticollis *Lec.* B.C.
Acalyptus carpini *Hbst.* Y.F.
Baris confinis *Lec.* S.M.

CALANDRIDÆ.

Dryophthorus corticalis *Say.* S.M.

SCOLYTIDÆ.

Xyloterus bivittatus *Kirby.* T.L.
Dryocœtes septentrionis *Mann.* B.C.
Dendroctonus rufipennis *Kirby* [obesus *Mann.*]. B.C.

ANTHRIBIDÆ.

Gonotropis gibbosus *Lec.* C.C.

Report of Progress, 1882–83–84, p. 62d.

List of Coleoptera collected by J. R. Spencer, at Fort Churchill, (determined by Mr. J. B. Smith for Mr. James Fletcher, 14 species).

Carabus chamissonis *Fisch.*, var. baccivorus *Fisch.*
Pterostichus hudsonicus *Lec.*
Amara hyperborea *Dej.*
similis *Kirby.*
Agabus [Gaurodytes] griseipennis *Lec.?*
Colymbites sculptilis *Harr.*
Dytiscus dauricus *Gebl.* [confluens *Lec.*].
Cryptohypnus abbreviatus *Say.*
Criocephalus obsoletus *Rand.*
Neoclytus conjunctus *Lec.*
Pachyta liturata *Kirby.*
Acmæops proteus *Kirby.*
Two species unknown to Mr. Smith.

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Annual Report (new series), Vol. I., 1885, p. 26dd.

List of Coleoptera collected in 1885, by Dr. Robert Bell, in connection with the Hudson's Bay expedition, (determined by Dr. G. H. Horn for Mr. W. H. Harrington, 10 species).

Stupart's Bay.

Amara hypoborea *Dej.* Over 100 specimens.
Pterostichus hudsonicus *Lec.*
Hydroporus longicornis *Sharp.* Occurs in Europe.
perplexus *Sharp.*
Agabus dissimilis *Sahlb.* [longulus *Lec.* ?]. Fifty specimens.

After the list was printed, Dr. Horn sent specimens of this species, which he had referred with doubt to *longulus* Lec., to Dr. Sharp, who determined them to belong to *dissimilis* Sahlb.

Cape Chudleigh.

Nebria Sahlbergi *Fisch.*
Amara hyperborea *Dej.*
Lepyrus colon *Linn.*

Cape Digges.

Amara hyperborea *Dej.*
Agabus dissimilis *Sahlb.* [longulus *Lec.* ?].
Criocephalus agrestis *Kirby.*

Blanc Sablon.

Nebria Sahlbergi *Fisch.*
Pterostichus Luczotii *Dej.*
Quedius sublimbatus *Mäkl.*

Annual Report (new series), Vol. III., p. 75j.

List of Coleptera taken on the South Coast and Islands of James Bay, by Mr. J. M. Macoun, in 1887, (determined by Mr. James Fletcher, Dominion Entomologist, 21 species).

Cicindela 12-guttata *Dej.*
Calosoma frigidum *Kirby.*
Chlænius sericeus *Forst.*
Silpha lapponica *Hbst.*
Buprestis maculiventris *Say.*
Asemum mœstum *Hald.*
Criocephalus obsoletus *Rand.*
Xylotrechus undulatus *Say.*

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Rhagium lineatum *Oliv.*
Pachyta liturata *Kirby.*
Acmæops proteus *Kirby.*
Leptura chrysocoma *Kirby.*
Monohammus scutellatus *Say.*
Orsodacna atra *Ahr.*
Adoxus obscurus *Linn.* [vitis *Fab.*].
Lina lapponica *Linn.*
Gonioctena pallida *Linn.*
Upis ceramboides *Linn.*
Lepyrus colon *Linn.*

P.S.—Line 18, page 155, should read longulus *Lec.* [Gaurodytes]. Y.F.

BOOK NOTICE.

THE PHYCITIDÆ OF NORTH AMERICA, BY GEO. D. HULST.

This valuable paper forms number 2, volume 17, of the Transactions of the American Entomological Society. The author not only gives us what has been done on this family by others, but also the results of his own critical and long continued study and investigation.

He complains of difficulties in the study of these insects owing to the fact that so many of the types are in European museums, and further, that so many are in private collections. There may be some question whether this last is not an advantage, for, as a rule, private collections are more easily accessible than public ones, and the visitor is not hampered by stringent rules. There is but little use to attempt the study of microlepidoptera in a museum where the rules forbid the removal of an insect from the trays, as is the case in many.

The Phycitidæ are given family rank "in the super-family Pyralidæ," and after the family characters, the literature of the subject is quite fully and very fairly given, which is always a difficult task. Mr. Hulst divides the family into two sub-families, based on the presence or absence of the lower anal plate, and differs from Ragonot, who divides them on the development of the tongue. From my own studies I am inclined to agree with Mr. Hulst.

The structure of the imago is treated thoroughly and exhaustively.

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This part of the work is a model worthy of imitation by other systematic writers. When all our insects have been studied in this careful manner and then monographed, we shall have a sound basis for further work.

A vast field is open for future investigation on the early stages of these insects, and undoubtedly our economic entomologists will, in time, give us much valuable information in this direction now that the way is made clear.

The author states that he "takes little interest, comparatively, in the guesses which are made of the ancestry of any group of the Lepidoptera." I am greatly surprised that he should decline to enter upon this fashionable field of conjecture. A person may as well be out of the world as out of fashion!

There are given synopses of the sub-families and of the genera, and under each genus is a synopsis of the species. A valuable feature is the giving of the type under each genus and the full synonomy. A list of undetermined species is also given with the original descriptions. Seven of these are Walker's species and the remaining three were published by Clemens. It would have been a great satisfaction if Mr. Hulst had given us the correct pronunciation of the generic names, especially those of Indian origin, for some of us may forget our Latin so far as to pronounce some of them incorrectly.

Under Notes on other Species, p. 221, by a slip it is stated that *Nephopteryx intractella* Walk. is a synonym of *Blepharomastix ranalis* which is itself a synonym of *Botis similalis* Guen. As the information went from me, and I may have made the slip myself in writing, I take this occasion to correct and say that *Nephopteryx intractella* Walk. is a synonym of *Nymphula similalis* Guen., and is given in Grote's Check-List under the name of *Eurycreon rantalis* Guen. See Ent. Am., Vol. 5, p. 211.

At the end is given a catalogue of the Phycitidæ of North America, comprising 71 genera and 201 species, followed by three plates of structural details.

On the whole this is one of the most satisfactory papers on the microlepidoptera I have ever seen, and it is "devoutly to be wished" that Mr. Hulst will immediately take up the *Geometridæ* and treat them in as thorough and complete a manner as he has the *Phycitidæ*.

C. N. FERNALD.

Mailed September 11th.

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The Canadian Entomologist.

VOL. XXII. LONDON, OCTOBER, 1890. No. 10.

PROCEEDINGS OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Club assembled in the State House at Indianapolis, Ind., on Wednesday, August 20th, 1890, and began its regular sessions at 9 o'clock a. m., the President, Prof. A. J. Cook, Agricultural College, Mich., in the chair.

There were present during the meetings :—W. B. Alwood, Blacksburg, Va.; Geo. F. Atkinson, Columbia, S. C.; W. S. Blachley; P. Carter; Prof. E. W. Claypole and K. B. Claypole, Akron, Ohio; F. S. Earle, Ocean Springs, Mich.; S. G. Evans, Evansville, Ind.; James Fletcher, Ottawa, Ont.; H. Garman, Lexington, Ky.; Mrs. O. Hanney; C. W. Hargitt, Oxford, Ohio; Thos. Hunt; John Marten, Albion, Ill.; Miss Mary E. Murtfeldt and Miss Augusta Murtfeldt, St. Louis, Mo.; W. W. Norman; Prof. Herbert Osborn and L. H. Pammel, Ames, Iowa; R. S. F. Perry; C. Robertson, Carlingville, Ind.; Prof. J. W. Spencer, Athens, Ga.; James Troop and Prof. F. M. Webster, Lafayette, Ind.; Dr. Clarence M. Weed, Columbus, Ohio, and others.

The President, Prof. A. J. Cook, delivered the following address :—

ON TEACHING ENTOMOLOGY.

LADIES AND GENTLEMEN OF THE ENTOMOLOGICAL CLUB,—I congratulate you that another year has passed, and our number has not been broken in upon by death. While our ranks have been much enlarged, no one has been called to that undiscovered country from whose bourne no traveller returns. I also congratulate you upon the great increment in our force of working entomologists. I think I may say, with no fear of contradiction, that no year in the history of America has been so remarkable in this respect as has the last. This is a cause for special felicitation, not only to entomologists, but to all our people. Ours is a tremendous country—by ours I include, of course, our Canadian brothers, for we, as scientists, know no line of separation—and to spy out the entire land needs an army of workers or observers, all trained to keen sight and

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ready apprehension. But more than this the magnitude of our country is fully equalled by the magnitude of the insect hosts, and to know all of these, with their full life history, requires an incalculable amount of closest research. But our business economy demands this for all our species: for so wonderful is the balance of nature, so close the relations of all species of life, that really we may hardly divide insects into those important and those unimportant in our agricultural economy. All are important; and so from an economic, no less than a scientific standpoint, it is desirable that all such research be widely encouraged, and it is a most hopeful omen—the rapid increase of earnest and trained workers. I shall not in this address occupy time by giving the peculiarities of the season in respect to insects, nor yet call attention to interesting discoveries, like the importation of the *Vedalia cardinalis*. All these will be brought out in papers and discussions. I must, however, refer to the new association for the advancement of economic entomology, which was organized at Toronto a year ago, and which held its first meeting at Washington last November. This meeting, under the Presidency of Dr. Riley, was a valuable one; and that society promises much for the science of entomology, as well as for its economic development. It is also a matter of much interest that a new paper—"Insect News"—is started at that great centre of entomology—Philadelphia—which will also do much every way for our science. This, with the very excellent periodical "Insect Life," published by the Entomological Division of the Department of Agriculture, can but give new impetus to entomological research. In addition to these, we have an addition to Prof. Comstock's admirable work, which, when completed, will form a most valuable adjunct in the development of entomology. If we may judge from what we already have, this will be invaluable in every entomological laboratory. When the Society of Economic Entomologists was organized a year ago it was remarked by one of our first entomologists that that move sounded the death-knell of this Club. I then remarked that such ought not to be the case. That Society is to be composed only of those interested in economic entomology, and of course will only put emphasis in the direction of the practical aspects of the science; this more or less of entomologists in a wider sense, and so will include those interested in practical entomology and also in the science without relation to utility. The Club then may well continue. I believe it will live and thrive, and

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will be most helpful to entomologists and to our science. While the other Association will discuss economic questions, this Club will place no limit on either its discussions or its membership, only so far as entomology shall be its aim and purpose. No one doubts but that he who has a thorough training in the science of entomology will be far better prepared for practical work, and so there can be only the most cordial relation between the Association of Economic Entomologists and this Club. Indeed, many of our most active entomologists will be members of both. I have already stated the truism that only can he do the best practical work in entomology who is thoroughly well grounded in the general science of entomology. As we now have a great call for entomologists in our experimental stations, agricultural colleges, and as State entomologists, not to speak of the fact that every farmer and fruit-grower would be more successful if he were well informed in this science, it goes without saying that there ought to be in training men for just such work. It seems to me that it needs no argument to show that our agricultural colleges are just the places where this training should be given. They were founded to teach those subjects which would be most serviceable on the farm. Entomology is one of the chief of these. Thus it follows that every student of agriculture should have a thorough course in this science, with the practical aspect of the subject kept in the foreground. In thus presenting this science to large classes — I have from thirty to forty each year who study this subject in the course—the teacher will find some in each class who are specially fitted to succeed. They enjoy the study and work most earnestly just for the love of the pursuit. They have quick observation, and are very accurate and honest in all their work. It needs no prophet to bespeak success in this field for such students. Our agricultural colleges are just the places to discover the men who have great possibilities in this direction; just the places to give the training that shall best fit men to do the most valuable work. It will be my purpose in the remainder of this address to describe the equipment for such work, and to explain the method which I believe will give the best results. Of first importance is a good library; this should contain all the standard works, periodicals and monographs, so that students who may decide to study any insect or genus, may find what has been written on the subject. Of course this cannot be had at once, but it is so essential

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that no effort should be spared to build up a complete entomological library at the earliest possible moment. *True*, the scientist should study *things*, not books, but he will find a wide use of books most helpful in his study. Next to a library, such colleges should have good collections, which are often of more value than the library. A small show collection, illustrating the families and orders, and the several stages of the most injurious species of the place as well as the groups of beneficial ones should be open to the public. This will be studied and appreciated by the practical farmer, who, as he visits the college, will find it helpful, and will also interest and stimulate the under-class men, who will thus have their attention called towards insects before they commence the regular study, which will not occur till they are well along in the course. Drawing, botany, microscopy, and French and German, if thoroughly understood, will be great aids to the student who commences the study of entomology. Thus this study will come late in the course and the show collection will be whetting the appetite of the under-class men from the time they enter college until they commence the study. I would also have what I call a student collection—this is a pretty full collection from the locality of the college. This I would hang upon the wall of the lecture room, which I would have dark, except when in use, so as to preserve the colour of the specimens. I would have this in rather small cases, with glass in front and also back where it is desirable, as in case of Diurnals, to study both under and upper sides of the wings. This collection should show at least types of each group in all stages, from egg to imago, as well as nests, cocoons, etc. This is an object lesson ever before the student, is ever ready for use by the teacher to illustrate his lecture, and is at the disposal of the students in naming their own collections or in closer study of any group. It seems to me such a collection should be in every college. Lastly, I would have a laboratory collection which should be a biological collection, and the fuller the better. This is in large, tight, glass-faced drawers. I use the Harvard case. This is for the use of teachers and post-graduates who desire to study further in the science. It is too valuable for general use by the student or to be kept to satisfy general curiosity.

"THE COURSE OF STUDY."

As I have before remarked, before the student commences the study of insects he should have had a good course in free-hand drawing, should

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have had instruction in the use of the microscope and in preparing microscopic specimens and slides, and if he has a ready use of German and French it will be very helpful to him in his study. It is also desirable that the student should have had a full course in botany. The students of our college have had three terms of botany, one devoted entirely to microscopic botany, before they begin the study of entomology. I consider this very valuable preparatory work. Entomology is very close precise work, and the laboratory work if carried on for a less space than three hours at a time is not satisfactory. But three hours of such close work is very wearying unless the student has had a fitting preparation. Thus I am pleased that our students have had *vertebrate dissection* with human and comparative anatomy and physiology before they commence entomology. I know this seems the reverse of the natural method; as nature proceeds from lower to higher; vertebrate dissection is lighter and less trying to eye and brain than is the study of insect anatomy; thus I am pleased to have Anatomy and Physiology of Vertebrates precede that of the Arthropoda in our course. In our College the student attends a course of sixty lectures on the anatomy and physiology of insects, systematic entomology and the economic bearing of the subject. These lectures are illustrated by use of models, the student's collection of insects, already referred to, by microscopic preparations, mostly prepared at the College, and elaborate charts and drawings also prepared specially for our use. In connection with this course there are 36 hours of laboratory. Each student works three hours one day each week for twelve weeks. In this time they are able to study the internal anatomy, and to examine carefully and accurately one insect of each order. In connection with this several insects are traced to the genus by such keys as Leconte and Horn, Cresson, Williston, etc. Besides the above, each student makes a collection of from ten to twenty-five insects of each order, all neatly put up with date and locality label; each order by itself and all labelled as far as time will permit. Many students succeed in naming a large number of their specimens. Each student is also required to mount insects in all the approved ways. Small insects mounted on triangular pieces of cardboard or rectangles of cork with silver wires, while the larvæ are put in bottles of alcohol with rubber corks and also prepared by eviscerating and drying, while distended with air, in a heated oven. The students are also encouraged to prepare biological collections, in

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which they preserve the eggs, larvæ after each moult, pupa, cocoon, imago of both sexes, and of various sizes and the several variations. Some of our most enthusiastic students work out several such life histories, describing not only the separate stages, but the several parasites that work to destroy the insects. I regard this work as very valuable. It is excellent discipline for the mind and observation, gives accurate information of the most interesting kind, and arouses enthusiasm for the study as nothing else can. It is such work as this that will tell for the future of entomological research, that will make entomologists, who will honour alike the fields of pure and applied entomology. But such study ought not and will not stop here. Post-graduates will avail themselves of the opportunities which such laboratories offer. Last winter during our long vacation—ours is an agricultural college and our vacations must needs occur in winter, when farm operations are largely at a standstill—I had ten special students of entomology in my laboratory, one from South Dakota, one from Indiana, one from Ohio, one from Japan, one from Wisconsin, and the others from our own State. Nearly all were college graduates. Six special students, all graduates from colleges, have spent the year in my laboratory in special entomological study as post-graduate students. It seems to me that such are the young men who are going to develop the entomology of our country. They are the young men who can and will do grand work in our colleges and experimental stations. These young men each take up some special family or genus of insects, to which they give the major part of their time and study. They collect in all orders and give special attention to biological work, tracing the life histories of insects, identifying as far as possible the insects they capture and try to become familiar with entomological literature, so far as they are able. The students are mutually helpful to each other. As the laboratory may be said to be a sort of perpetual Natural History, or more accurately Entomological Society, thus the students become familiar with the general laboratory work, in fact, they each become a factor in some degree of carrying the work forward. Here I will close by explaining briefly the mode of our labaratory work, which differs in some degree from the admirable plan which Prof. Forbes explained at the Washington meeting of Economic Entomologists last November. Our labels give in compact space locality, date, accession and species number. The accession number agrees with a number—serial number—in our accession catalogue for the special year. Thus, ac. 400 shows that the insect or

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insects bearing that label were the 400th collected during that season. The sp. number is given as the insect is determined, and is the number of the insect in the catalogue which we use. Thus, sp. 25 is "Cicindela purpurea," as the beetle is numbered 25 in Henshaw's catalogue of Coleoptera. In case the catalogue is not numbered, as is the case with Cresson's list of Hymenoptera, then we number it. We have a column in our accession catalogue for date, collector, person who named the specimen, and also for remarks. This last column is wide, and in it we can usually write all necessary information which we received in the collecting. If we are experimenting with or studying the insect, our notes are kept on cards. These are numbered to agree with accession catalogue, and are kept in serial order until we know the species when we add the species number as well. We now index the card and place it in its correct alphabetical position in our card collections. Thus we can very easily find our notes on any specimen, either by accession number or by the name of the species. This plan works well, and, it seems to me, is very economical in respect to time. Of course our students all see this scheme and become familiar with its workings.

Dr. C. M. Weed had listened with much pleasure to the President's address and approved of most of the points brought forward. He considered a knowledge of French and German of the utmost importance from the frequent necessity of consulting works in those languages when working up the life-histories of insects. He did not, however, like the label submitted by Prof. Cook, thinking that it entailed too great an expenditure of time. He had adopted Prof. Forbes's system of labelling, and had found that it answered all purposes.

Prof. Herbert Osborn approved very highly of the course of instruction in entomology outlined in the address.

Dr. C. M. Weed then read a paper upon the life-history of the evening primrose curculio (*Tyloderma foveolatum*) which he had bred from the stems both of Œnothera and Epilobium in large numbers.

Prof. F. M. Webster had listened to the paper with much interest; as stated by Dr. Weed he had given some study to the insect in question, and was pleased to hear these further observations. He had found that when a plant was infested the beetle occurred in all its stages, and that those near the base were always further advanced towards maturity.

The meeting adjourned.

(To be continued.)

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ON THE FOOD-HABITS OF NORTH AMERICAN RHYNCHOPHORA.

BY WM. BEUTENMULLER, NEW YORK.

In the present paper I have attempted to bring together all the Food-Habits of North American Rhynchophora (except the Scolytidæ) that have been placed on record in the various entomological publications, with the addition of my personal observations on the subject.

Eugnamptus collaris and *E. angustatus* I have found plentifully upon the foliage of hickory and butternut trees.

Rhynchites bicolor may be found on various species of wild roses.

Pterocolus ovatus I have beaten from live oak trees at Kissimmee, Florida, May, 1887.

Attelabus bipustulatus lives on oak, rolling up the leaves (Murtfeldt, CAN. ENT., IV., p. 143). *A. analis* and *A. nigripes* also live on oak. The latter species I have beaten from live oak at Kissimmee, Florida, in April.

Graphorhinus vadosus feeds in the imago state on the leaves of clover, according to Mr. F. M. Webster (Am. Nat., 16, p. 746).

Epicærus imbricatus, according to Dr. C. V. Riley, is injurious to apple and cherry trees and gooseberry bushes, by gnawing the twigs and fruits; also said to be found on onions, radishes, cabbage, beans, watermelons, cucumbers, beets, squashes and potato, etc.

Exomias pellucidus. I have first taken this European beetle at Astoria, L. I., in the year 1884, and again on Staten Island in 1886. In Europe it lives on the strawberry. The food plant in this country has not yet been detected. (See Ent. Am., III., p. 188.)

Ophryastes vittatus is chiefly found on "greasewood," as is also *O. sulcirostris* and *O. latirostris*, according to Mr. Wickham (Ent. Am., V., p. 77).

Panscopus erinaceus occurs on wild grape. (Schwarz, Bull. Bklyn. Ent. Soc., VII., p. 84.)

Diamimus subsericeus was taken around the roots of cottonwood by Mr. Wickham (l. c., p. 78).

Otiorhynchus sulcatus. This European species is destructive to a variety of horticultural plants. In the larval stage it attacks the strawberry, devouring the roots. *O. ovatus* also infests the roots of this plant.

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Aragnomus griseus was recorded by Dr. C. V. Riley as an enemy to pear trees in Oregon. (Insect Life, Vol. I., p. 16.)

Pachnæus opalus is injurious to the orange in Florida. *P. distans* feeds on oak. (Riley, Am. Nat., 16, p. 916.)

Tanymecus confertus appears to be polyphagus, without preference for any particular plant. (Riley, l. c.)

Anametis grisea in the larval stage lives under the bark of apple and pear. (Riley, l. c.)

Pandeletejus hilaris lives in the trunk of the white oak. (Harris, Inj. Ins., p. 70), also found on beech trees by Mr. F. M. Chittenden.

Brachystylus acutus is only found on the persimmon. (Riley, l. c.)

Neoptochus adsperus feeds on oak. (Riley, l. c.)

Artipus floridanus is injurious to the orange. (Riley, l. c.)

Aramigus tesselatus, according to Mr. E. A. Popenoe, infests the sweet potato. (Industrialist, May 29th, 1886.)

Aramigus Fulleri feeds on the roots of roses. (Riley, Rep. Dept. Agricul., 1878.)

Aphrastus tæniatus lives on the paw-paw. (Riley, l. c.)

Scythropus elegans is found on the pine, according to Mr. W. H. Harrington. (Trans. Ottawa Field Nat. Club, Vol. I., No. 2, p. 33, 1881.) Mr. F. H. Chittenden also found the insect in abundance on pine *(P. strobus)* at Ithaca, N. Y.

Eudiagogus pulcher and *E. Rosenschœldi* both feed on *Cassia occidentalis* and *C. obtusifolia*. The former species I have found in large numbers at Enterprise, Fla., in May.

Sitones lineellus and *S. flavescens* are injurious to the clover and lucerne in Europe. *S. hispidulus* also lives on the roots of clover.

Plinthodes tæniatus I have beaten from small alder bushes in the Orange Mts., New Jersey. Whether the species lives on this plant I am unable to say.

Ithycerus noveboracensis is found on white and burr oaks. The larva bores in the tender twigs. I have also found the insect on hickory. Mr. W. H. Harrington found it on beech trees. (Rep. Ent. Soc., Ont., p. 52, 1880.)

Apion herculanum occurs on the flowers of *Viburnum acerifolia*, according to Dr. Hamilton. (CAN. ENT., 20, p. 67).

Apion rostrum infests the seed pods of wild indigo *(Baptisia tinctoria)*.

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Apion nigrum sometimes depredates the leaves of locust (*Robinia pseudacacia*). *A. fraternum* was observed upon two species of *Lespedeza* by Mr. F. H. Chittenden. *A. segnipes* was obtained from the seeds of a species of *Astragalus* by Say. (Le Conte, Ed., p. 265.)

Podapion gallicola makes a spherical or ovoid gall on pine (*Pinus inops*), Riley. (Bull. Bklyn. Ent. Soc., VI., p. 61.) I have also found the galls in the vicinity of Washington, D. C., last June.

Phytonomus punctatus lives on the leaves of clover. I have found it in abundance on timothy grass this season. *P. nigrirostris* also feeds on clover and *Buphthalmum Salicifolium*. *P. comptus* lives on *Polygonum*, and *P. eximius* on *Rumex*. (Riley, Rep. Dept. Agricul., 1881–82, p. 171.)

Listronotus latiusculus was found by Mr. C. M. Weed in all stages in the stalks of *Sagittaria variabilis*. Mr. F. M. Chittenden found *L. tuberosus*, *L. caudatus* and *L. appendiculatus* while sweeping a small patch of aquatic plants composed entirely of *Sagittaria* and a species of *Carex*. *L. appendiculatus*, it is said, was found by Mr. William Julich breeding in the lower parts of the stems of some species of reed. I have also taken two species of *Listronotus* on the flower heads of *Sagittaria* at Shingle Creek, Kissimmee, Florida, April.

Pissodes strobi is sometimes very destructive to the white pine. The larva and imago were first figured by Peck, in 1817. (Mass. Agricul. Reposit., IV., pp. 205, 211, pl. 1.) *P. affinis* is also found on the pine.

Pachylobius picivorus is placed by Mr. W. H. Harrington in a list of insects found on pine (Trans. Ottawa Field Nat. Club, I., p. 33).

Hylobius pales lives in pine trees beneath the bark, burrowing into and destroying the inner surface of the bark, and the tender newly formed wood, often doing great damage to pine forests.

Lixus rubellus has been observed in considerable numbers clinging to the leaves and blossoms of *Polygonum amphibium*. (Webster, l. c.)

Lixus parcus is said by Dr. Riley to form galls in the stems of *Amelanchier*. (Proc. Ent. Soc., Wash., I., p. 33.)

Lixus concavus. Glover has observed this insect burrowing in the foot stalks of rhubarb or pie plant. (Rep. Com. Agri., p. 90, 1865.) I have also found it on a species of *Rumex*, and also producing a gall in the stalk of the thistle, from which I raised the species. Mr. Webster also bred it from wild sunflowers. (Ent. Am., V., p. 11.)

Lixus macer. Dr. Riley reared this species from *Chenopodium*

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hybridum. Coquillett observed it ovipositing in wild sunflower, as also did Mr. Webster. (Ent. Am., V., p. 11.)

Barytychins discoideus breeds in the flower heads of *Helenium tenuifolium.* (Schwarz, l. c.)

B. amœnus was found on ragweed by Dr. Hamilton. (CAN. ENT., 8, p. 114.)

Smicronyx griseus and *S. tychoides* occur on ragweed *(Ambrosia)*, according to Dr. Hamilton (l. c.)

Anchodemus angustus has been found by Mr. Harrington eating the leaves of a species of *Sagittaria.* (CAN. ENT., 16, p. 118.)

Strophosomus coryli has been found by Mr. Bailey on sweet birch *(Betula lenta)*, Jülich (Ent. Am., V., p. 56). In Europe, the species lives on oak, beech, pine and hazel.

Lissorhoptrus simplex lives on the roots of rice. (Riley, Rep. Dept. Agricul., p. 130, 1881–82.)

Magdalis barbita has been found ovipositing in fallen hickory *(Carya amara)*, by Mr. Harrington. (Ent. Am., I., p. 18.)

Magdalis olyra burrows under the bark of oak. *M. armicollis* inhabits the elm.

Magdalis alutacea probably bores in the terminal twigs of *Pinus inops.* (Riley, Bull. Bklyn. Ent. Soc., VI., p. 62.)

Coccotorus scutellaris attacks the fruit of the plum.

Anthonomus quadrigibbus punctures the fruit of the apple and pear. The larva lives in the heart of the fruit, and feeds around the core.

Anthonomus suturalis attacks the cranberry, laying its eggs in the bud, and the larva living inside the fruit.

Anthonomus sycophanta was bred from the galls of a sawfly on willow.

Anthonomus musculus is very destructive to the strawberry.

Anthonomus pusillus lives in the seed pods of the frost weed *(Helianthemum canadense).* Blanchard (Ent. Am., III., p. 87).

Anthonomus gularis oviposits in the flowers of *Cassia marylandica.* (Schwarz, l. c.) *Anthonomus flavicornis* was found by Mr. Schwarz, inquilinous in a globular acarid gall on the leaves of *Solanum eleagnifolia.*

Otidocephalus chevrolatii occurs on elm and hickory, according to Mr. W. H. Harrington. (CAN. ENT., 16, p. 118.) *O. laevicollis* was hatched by Dr C. V. Riley from the galls of a species of Cynips on oak.

Elleschus ephippiatus. I have taken this species in abundance on willow *(Salix fragilis).*

(To be continued.)

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 180, Volume xxii.)

Genus HALISIDOTA Hübner.

1816—Hübn., Verzeichniss, 170.
1855—Wlk., C. B. Mus., Lep Het., III., 732.
1862—Morris, Synopsis, 347.
1873—Stretch, Zyg. & Bomb., 87, fig. venation.

Head rather well developed; palpi exceeding front; tongue moderate, but somewhat variable in the species. Antennæ of ♂ long, lengthily bipectinated to the tip, a single branch to each side of each joint. Legs short and stout, posterior longest and weakest; spurs normal, but short; claws of tarsi simple.

Primaries with v 10 out of the subcostal before the end of the cell; 7–9 on a stalk from the same point with 6; 8 and 9 branching just before the tip; 4 and 5 from the same point at the end of the median; 3 from the median some distance before the end of the cell.

Secondaries with 8 from about the middle of subcostal and very short; 6 and 7 from the same point at end of the subcostal; 4 and 5 together from the end of the median; 3 from the median before the end of the cell.

H. caryæ served as the subject on which the above studies were made. It is not improbable that there may be some difference in details of structure in the species. Many of the described forms I have seen but casually, and of a few I have seen large series. This is, in my opinion, the most difficult genus in the *Arctiidæ*. There is a *phytophagic* variation in the larva, and the larvæ are not all of the same type. From the material in the National Museum collection it would seem, too, that larvæ widely different in type, not color merely, produce insects that are superficially almost indistinguishable. The synonymy is involved, and I give it exactly as I have found it.

H. agassizii Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 128, *Halisidota*.
1873—Stretch*, Zyg. & Bomb., 87, 102, pl. IV., ff. 8 and 9, and pl. X., f. 7, *Halisidota*.

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1873—Edw., Proc. Cal. Ac. Sci., V., 187, *Halisidota.*
var. *alni* Hy. Edw.
1875—Edw.*, Proc. Cal. Ac. Sci., VII., 129, *Halisidota.*
Habitat—California.

Food plant—Willow, Alder.

H. ambigua Strk.

1878—Strk., Proc. Dav. Ac. Sci., II., 272, pl. IX., f. 7, ♂, *Halisidota.*
bolteri Hy. Edw.
1884—Edw., Papilio, IV., 121, *Seirarctia.*
1888—Edw., Ent. Amer., III., 182, *pr. syn.*
Habitat—Colorado, New Mexico.

H. argentata Pack.

1864—Pack., Proc Ent. Soc., Phil., III., 129, *Halisidota.*
1873—Stretch*, Zyg. & Bomb., 87, pl. 6, f. 12, ♀, *Halisidota.*
1873—Edw., Proc. Cal. Ac. Sci., V., 187, 369, *Halisidota.*
Habitat—California, Vancouver.

Food plants—Pinus pondorosa and P. lambertiana.

H. californica Wlk.

1865—Wlk., C. B. Mus., Lep. Het., XXXI., 311, *Halisidota.*
1873—Stretch, Zyg. & Bomb., 102, =*agassizii.*

angulifera Wlk.

1866—Wlk., Lords Trav. in Vanc. App., 335, *Halisidota.*
1873—Stretch, Zyg. & Bomb., 102, =*agassizii.*

salicis Bdv.

1868—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 81, *Phægoptera.*
1869—Grt. & Rob., Tr. Am. Ent. Soc., III., 175, *pr. syn.*
Habitat—British Columbia, Vancouver, California.

Mr. Grote, in his list of 1882, does not follow Stretch in his reference of this species to *agassizii*, but in a note, p. 63, suggests that *californica*, *agassizii* and *argentata* may be the same species.

H. caryæ Harr.

1841—Harris*, Rept., Ins. Mass., 258, *Lophocampa.*
1855—Fitch*, 1st Rept., Ins. N. Y., 159, *Halisidota.*
1860—Clem., Proc. Ac. Nat. Sci. Phil., XII., 533, *Halisidota.*

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1862—Harris*, Inj. Insects, 361, pl. vi., ff. 1 and 2, and f. 175, *Lophocampa.*

1862—Morris in note to Harris l. c., *Halisidota.*

1862—Morris, Synopsis, 349, *Halisidota.*

1863—Saund., syn. Can. Arct., 20, *Halisidota.*

1872—Pack.. 4th Rept. Peab. Ac., 87, *Halisidota.*

1873—Stretch*, Zyg. and Bomb., 87, 140, pl. VI. f. 11, *Halisidota*

1874—Lint.*, Ent. Cont., III., 148, *Halisidota.*

porphyria H. Sch.

1855—H. Sch., Lep. Exot. sp. nov. f., 283, *Phægoptera.*

1858—H. Sch., l. c. p. 81, *Halisidota.*

1864—Pack., Proc. Ent., Soc., Phil,, III., 128, *pr. syn.*

annulifascia Wlk.

1856—Wlk., C. B. Mus., Lep. Het., III., 743, *Halisidota.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 533, *Halisidota.*

1862—Morris, synopsis, Supplt., 349, *Halisidota.*

1862—Clem., in Morris Syn., 352, *pr. syn.*

1864—Pack., Proc. Ent. Soc., Phil., III., 128, *pr. syn.*

Habitat—Maine, New York, New Jersey, Mass., Arizona, N. Mexico, California, Canada.

Food-plants—Elm, hickory, Ash.

H. cinctipes Grt.

1865—Grt., Proc. Ent. Soc., Phil., V., 242, *Halisidota.*

1866—H. Sch., Corr. Blatt, Regensb., XX., 130, *Halisidota.*

188—Gundlach*, Cont. Ent., Cuba, 269, *Halisidota.*

1884—Hy. Edw., Papilio, IV., 76, *Halisidota.*

tessellaris‡ Wlk.

1856—Wlk., C. B. Mus., Lep. Het., III., 733, *Halisidota.*

1869—Grt. and Rob., Trans. Am. Ent. Soc., II., 72, *pr. syn.*

Habitat—Texas, Florida (?), Mexico, Cuba.

Food-plant—*Hibiscus* (Gundlach).

I have in some way mislaid my original reference to Gundlach's work, and do not find the date in the copy.

H. davisii Hy. Edw.

1873—Edw., Proc. Cal. Ac. Sci., V., 365, *Halisidota.*

Habitat—Arizona.

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H. edwardsii Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 129, *Halisidota.*
1873—Stretch., Zyg. and Bomb., 88, pl. III., f. s, *Halisidota.*
1875—Edw.*, Proc. Cal. Ac. Sci., VII., 21—egg and young larva.

translucida Wlk.

1865—Walk , C. B. Mus., Lep. Het., XXXI., 310, *Halisidota.*
1868—Grt. and Rob., Trans. Am. Ent. Sci., II., 85, *pr. syn.*

quercus Bdv.

1868—Bdv., Lep., Cal. (Ann. Soc. Ent., Belg., XII.), 81, *Phægoptera,*
1869—Grt. and Rob., Trans. Am. Ent. Soc., III., 175, *pr. syn.*
Habitat—California.

H. ingens Hy. Edw.

1881—Edw., Papilio, I., 39, *Halisidota.*
Habitat—Arizona.

H. labecula Grt.

1881—Grt., Papilio, I., 174, *Halisidota.*
Habitat—New Mexico.

H. laqueata Hy. Edw.

1886—Edw., Ent. Amer., II., 166, *Halisidota.*
Habitat—Texas.

H. maculata Harr.

1841—Harris*, Rept. Ins., Mass., 259, *Lophocampa.*
1860—Clem., Proc., Ac. Nat. Sci., XII., 534, *Halisidota.*
1862—Morris, Synopsis, 349, *Halisidota.*
1862—Harris*, Injurious Insects, 363, *Lophocampa.*
1871—Saund.*, CAN. ENT., III., 186, *Halisidota.*
1873—Stretch., Zyg. and Bomb., 87, *Halisidota.*

fulvoflava Wlk.

1856—Wlk., C. B. Mus., Lep. Het., III., 733, *Halisidota.*
1858—H. Sch., Lep. Exot., sp. nov., 71, *Phægoptera.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 534, (?) *pr. syn.*
1862—Morris, Synopsis, App., 349, *Halisidota.*
1862—Clem., in Morris Syn., 352, (?) *pr. syn.*
1863—Saund., Syn. Can. Arct., 21, *Halisidota.*

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1864—Pack., Proc. Ent. Soc., Phil., III., 128, *pr. syn.*

guttifera H. Sch.

1855—H. Sch., Lep. Exot., sp. nov., f. 284, *Phægoptera.*

1858—H. Sch., l. c., p. 71, *pr. syn.*

Habitat—Nova Scotia, Canada, Maine, Massachusetts, New York, New Jersey, Illinois, California.

Food Plant—Oak.

Halisidota megaphyrrha, Wlk., XXXI., 308, which should come in here has been referred to by Messrs. Grote and Robinson as not North America.

H. minima Neum.

1883—Neum., Papilio, III., 138, *Halisidota.*

Habitat—Arizona.

H. mixta Neum.

1882—Neum., Papilio, II., 133, *Halisidota.*

Habitat—Arizona.

(To be continued.)

ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Annual Meeting of the Society was held in the rooms, Victoria Hall, London, on Wednesday, August 27th. The following officers were elected for the ensuing year :—President, Rev. C. J. S. Bethune, D.C.L., of Port Hope ; Vice-President, Mr. James Fletcher, of Ottawa ; Secretary. Mr. W. E. Saunders, of London ; Treasurer, Mr. J. M. Denton, of London. Directors—Messrs. W. H. Harrington, Ottawa ; J. D. Evans, Sudbury ; Gamble Geddes, Toronto ; A. W. Hanham, Hamilton ; J. A. Moffat, London. Curator and Librarian, Mr. J. A. Moffat, London. Editor of the CANADIAN ENTOMOLOGIST, Rev. C. J. S. Bethune, Port Hope. Editing Committee, Mr. W. E. Saunders, London ; Rev. T. W. Fyles, Quebec ; H. H. Lyman, Montreal. Delegate to the Royal Society of Canada, Rev. T. W. Fyles, Quebec. Auditors, Messrs. J. H. Bowman and H. P. Bock, London. The President's address and a full account of the proceedings will be published in the Annual Report of the Society.

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THE BUTTERFLIES OF INDIA.*

Some three years or more ago, we noticed a work on the above subject by Marshall and de Nicéville, of which two volumes had been published, the last by de Nicéville alone. A third volume of over 500 compact pages has just come to hand, the most notable thing about which, at least to a dweller in temperate regions, is that it is wholly concerned with the Lycaenidæ, of which eighty-two genera and over four hundred species are described. Such wealth in these pigmies among butterflies is a striking fact. The author, however, beyond the generic collocation, has made no attempt to classify this immense assemblage, contenting himself with only distinguishing certain groups of genera by the name of one of the included genera, as the "Thecla group," etc., which groups are characterised in a general but not formal way in the body of the work. These agree tolerably well with the groups Doherty had previously characterised from the egg alone, but are about twice as numerous and are established mainly upon the structural features of the imago. This is better than Distant's artificial divisions, but there is plainly an open field here for investigation, and one which there is apparently no need for great delay in occupying, since (excepting the egg) the early stages of Lycaeninæ appear to offer less service to the systematist than in any other group of butterflies.

What will surprise one in this volume, is the very considerable addition to our knowlege of the early stages of the Lycaeninæ, for excepting the Hesperidæ, this group is in general the least know of butterflies. Yet something is recorded of no less than thirty-four genera, much of it new, and in many a good deal of interesting history is related. This is a great improvement on the preceding volumes. One particular case, that of the pomegranate butterfly, whose history was briefly and partially given by Westwood, seems valuable enough to reprint for the benefit of American readers; and another, Curetis thetis, may well be mentioned here:—"The twelfth segment [of the larva] bears two most extraordinary structures, which consist of two diverging, cylindrical, rigid pillars, arising from the subdorsal region and of a pale green colour. When the insect is touched or alarmed, from each pillar is everted a deep maroon tentacle as long as the rigid pillar, bearing at its end long

*The Butterflies of India, Burmah and Ceylon. By Lionel de Nicéville, Calcutta. Vol. 3. 12+503 pp. 6 pl. 1890. 8°.

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parti-coloured hairs, the basal third of each hair being black, the upper two-thirds white. The maroon tentacle with its long hairs spread out like a circular fan or rosette is whirled round with great rapidity in a plane parallel to the body, its use being almost certainly to frighten away its enemies, as this larva, as far as I am aware, is not attended by protecting ants and lacks the honey-gland on the eleventh segment present in so many lycænid larvæ which are affected by ants."

Ants have been found attendant upon half a dozen genera, and in many cases they have been identified by Dr. A. Forel, of Switzerland. At least a dozen species are concerned, and they are about equally divided between the Formicidæ and Myrmicidæ.

Spalgis, it appears, is another instance of a carnivorous lycænid comparable to our Feniseca, the larva associating with and feeding upon the "mealy bug" of the planters, a species of Dactylopius. De Nicéville in no way favors Edwards's belief that Feniseca belongs to the Lemoniinæ, and adds nothing, as we had hoped he might be able to do, to Holland's suggestion that Liphyra, too, might be carnivorous, though he points out that the two genera differ in their perfect state in the number of subcostal nervules, and are therefore not so closely allied as Dr. Holland thought.

The seasonal dimorphism of many Indian Lycænidæ is well brought out, the dry and wet season taking the place of our spring and summer; indeed, it occurs in no less than eighteen genera, and this will be a revelation to many, and seems to bid fair to renovate the study of tropical butterflies. But while in India proper, "the seasonal forms seem to be chiefly restricted to two, a wet and a dry," in the Himalayan district of Sikkim "the dry season form which occurs at the end of the year differs somewhat from the dry season form which occurs in the spring, so that with regard to some species there may be said to be three forms—a spring, a wet season, and a winter form." Sexual dimorphism on the contrary is very rare among tropical Lycænidæ, de Nicéville stating that he does not know positively of any case, though he suspects it in a species of Zephyrus. On the authority of Doherty (a native of Cincinnati by the way, working most industriously in the east,) he credits half a dozen or more species as mimicking others of the same or neighboring groups of Lycænidæ. Much attention is also paid to the secondary sexual characteristics so far as their gross appearances are concerned, and they are noted in no less than nineteen genera.

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Finally, we may call attention to the very interesting general chapter on the Lycænidæ at the beginning of the volume, which is of more than usual interest and rather exceptional in a work of this kind. The work itself must serve a very useful purpose; its execution is remarkably even and shows great skill and balance on the part of the author. There are half a dozen plates like those of the former volumes and executed by the same parties, excepting that two of them are chromo-lithographs, but we could wish that some plates of the early stages might have been added, and the direct purposes of the book for the Indian student would have been served by others giving structural details.

SAMUEL H. SCUDDER.

PARTIAL PREPARATORY STAGES OF ERYCIDES BATABANO, LEF.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

EGG.—Nearly spherical, the base flattened a little. Around the sides are eighteen vertical ribs, every other one shorter, not reaching the summit. The natural color could not be ascertained.

* * * * * * *

THIRD (?) LARVAL STAGE.—Head much larger than joint 2, flat before, broadly excavate at the summit, minutely granulated. Colot wine red, blackish on the lower third, with a large round orange spor before the eyes on each side. Width of head 2.5 mm. The body tapers to each extremity. Its color is wine red, with a darker shade over the dorsum centrally, and seven transverse orange stripes on the upper half of the body on joints 5 to 11, anteriorly, the posterior ones interrupted dorsally. Venter a little whitish. Length of larva about 10 mm. It forms a place of concealment in the manner of *Endamus tityrus* or *E. proteus* by folding over a portion of the leaf and securing it by threads.

FOURTH LARVAL STAGE.—Head much as before but the black shade is less and the granulations more distinct. Width 3.8 mm. Body marked as before; very minutely pilose and with small semi-obsolete circular

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spots. Spiracles small and whitish. The cervical shield covers the upper half of joint 2, is smooth and wine red. Length of larva 20 mm. When disturbed, it ejects from its mouth a large quantity of dark red fluid.

FIFTH LARVAL STAGE.—Mature larva. Head pale brown, blackish around the mouth with a large round orange spot before the eyes. It is granulated and pilose, the hairs small, and appearing frosted on the upper part of the head. Width 6 mm. The body is much contracted, and much smaller at the extremities. Cervical shield pale brown, smooth, hidden when the insect is at rest. Joint 2 is pinkish below. The body is bright frosted white, thickly covered by little circular depressions, in the centre of each of which is a minute frosted hair. These hairs are longer on the anal plate, and the depression there less deep. Thoracic feet pale brown. Venter and abdominal feet white, without the marks of the dorsum. Length of larva 40 mm., greatest width of body 12 mm., greatest height 10 mm., width of joint 2 4.5 mm. Its place of concealment, at this stage, is formed of several leaves spun together and lined with silk. Immediately after the moult, the body is colored as in the previous stage, but the white color appears gradually in the course of several days.

The leaves the larva has spun together serve as its cocoon, and the pupa is held by several transverse threads around the body, with the cremaster fastened in others.

PUPA.—Robust; abdomen large, eyes prominent. Two short prominences on the head between the eyes. The leg and antennæ cases form a point extending below the wing cases. Cremaster excavate below, with ridges at the sides above, curved downward, blunt, and terminating in a number of brown hooks. The pupa has many small, rounded depressions, and is minutely pilose. Color creamy white, a greenish tint on the thorax and cases, and a yellow stripe on the upper part of the eye. Length 32 mm., diameter of the abdomen 10 mm., diameter of thorax 9 mm., width through the eyes 6 mm.

FOOD PLANT.—Mangrove, *Rhizophora mangle;* larvæ from Dade Co., Florida. I am not sure that the larval stage here first described is the *third*, but consider it most probable.

Mailed October 6th.

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The Canadian Entomologist.

VOL. XXII. LONDON, NOVEMBER, 1890. No. 11.

PROCEEDINGS OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

(Continued from page 199.)

The Club met again at 5 o'clock, August 20th. Mr. J. Fletcher presented some notes upon injuries caused by the Hessian Fly, the Wheat-stem Maggot and an undetermined species of Oscinis. He said that the note was presented with the object of eliciting further information upon a subject which had proved of great interest to him. During the past season he had endeavored to determine the number of broods of the Hessian Fly for the Ottawa district, and had found, first, that the Hessian Fly, the Wheat-stem Maggot and Oscinis were all found at the same time and in the same plant, and further, that, speaking generally, they passed through their stages contemporaneously. Of the three the last had proved much the most destructive. From root shoots of wheat sown on the 14th of April he had bred Hessian Fly and Oscinis at the end of June, and a month later Meromyza had appeared. He had also noticed in some fields at Ottawa that a large quantity of spring wheat was attacked by Hessian Fly in the ground shoots, or stools, in the same manner as fall wheat is attacked in the autumn. It was frequently the case that on plants which had made from fifteen to twenty stools but one would be left, all the others having been destroyed by the insects. He had procured adult Hessian Flies at Ottawa during this season in the beginning of May, at the end of June, and in August, and they would probably appear again in September. He had not been able to find the Hessian Fly breeding in any of the grasses, and would like to know if others had done so. Meromyza and the Oscinis had been most troublesome pests in the experimental grass patches at Ottawa, some grasses being almost exterminated by them. It was remarkable that the spring appearance of Meromyza had been so enormous as to have caused fear of a serious destruction of the wheat

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crop. As a matter of fact, however, there had been less injury, both to small grains and grasses, than for many years previously. This diminution he could only explain by the supposition that the eggs had been destroyed by some predaceous insect. The eggs must have been laid in large numbers, but there was very little evidence of the presence of the larvæ, either in the standing wheat or barley, or in the root-shoots of barley. The Oscinis he had been unable to identify; but, through the kindness of Mr. John Marten, of Illinois, he had learnt of some work which had been done by Prof. Garman in Kentucky, upon what was probably the same species. This, Mr. Marten said, had been doubtfully identified by Dr. Williston as *O. variabilis.*

Prof. Garman stated that he had studied what appeared to be the same species, and had prepared an article for publication. He also gave some notes upon the life history and anatomy of the insect.

Prof. Osborn had taken at Ames, Iowa, numerous specimens of Oscinis, one of which closely resembled that exhibited by Mr. Fletcher.

Prof. Alwood had studied in Ohio an Oscinis infesting oats, and had published his results in Bulletin 13, Division of Entomology. He had found the eggs, from two to eleven in number, were forced beneath the sheath of the leaf, and that just prior to pupation the larva gnawed through the epidermis and the pupa protruded so as to admit of the easy escape of the adult.

Mr. Fletcher, referring again to Meromyza, stated that in many instances he had found the egg deposited in the field upon the upper surface of the leaf some distance from the stem, and asked if others had observed this to be the case elsewhere.

Prof. Garman had found that the eggs were laid just above the sheath, or sometimes pushed beneath it.

Prof. Webster stated that the eggs of the Hessian Fly had, in the spring of the present year, throughout Southern and Central Indiana, been deposited near the roots, the "flax-seeds" being found in that portion of the plant; while in the northern part of the State the case had evidently been different, as the "flax-seeds" were there almost invariably located about the second joint.

The Secretary read a paper by Mr. Edward L. Graef, of New York, upon the American Silk Worm Moths or Spinners, in which a serious

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attack upon the shade trees of New York by *P. cecropia* was recorded, and the suggestion made that this and other species might be turned to account, if any means could be devised for manufacturing and utilizing their silk. As a stimulus to this industry, Mr. Graef generously offered a prize of fifty dollars for the best essay and model of apparatus for carrying this suggestion into effect.

Thursday, August 21st.—The Club met at 8 a. m. Dr. C. M. Weed read an interesting paper upon the clover-stem borer, *Languria mozardi*. Fifteen species of plants were reported upon which the larva had been found feeding. This paper was discussed by Profs. Cook, Alwood, Osborn and others.

Prof. Alwood spoke of tobacco insects, of which he was making a special study. He had observed a stem borer which was very injurious.

Dr. Weed had learned of a tobacco root-louse in Southern Ohio.

Prof. Garman spoke of the mouth parts of several species of some families of Thysanoptera, and stated that some recent studies had shown him that the figures published did not agree with his material. He then read the following paper :—

AN ASYMMETRY OF THE HEAD AND MOUTH PARTS OF THYSANOPTERA.

In a brief paper in the Bulletin of the Essex Institute I have recently called attention to peculiarities in the structure of the head and mouth parts which set this group quite apart from other orders of Hexapoda. [This has no reference to affinities upon which, I believe, we are not prepared to pronounce until this and several other groups have been more completely studied.] In that paper it was claimed that the endocranium of the species examined was not symmetrical, being deficient on the right side; that the labrum was one-sided; that there was a developed mandible on the left side, with, at most, a rudiment on the right; and that the mandibles of authors were probably lobes of the maxillæ.

At the time the paper was written I had not examined sufficient material to enable me to say whether the features pointed out were limited to certain species or were common to all members of the group. Since then many additional forms have been examined, all, however, belonging to the families Stenopteridæ and Coleoptratidæ, and in no case has there been found a departure in essentials from the structure of the head and

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mouth parts as they were described in the paper referred to. It is probably safe to assume, threfore, that the asymmetry noted is characteristic of these two families at least.

Of the group Tubulifera no representatives have been studied. I shall not be surprised, since this is the lowest of the suborders, if examples of Phlæothrips are found to be more nearly symmetrical.

As an interesting fact, though in no way related to the main purpose of this communication, I may mention that the solitary mandible of Limothrips and Melanothrips is perforate, like the jaws of larval Chrysopa, of Dytiscidæ, and of Myrmeleon. In specimens of Coleoptratidæ examined, both labial and maxillary palpi are composed of three segments.

Note.—Since my return to Lexington from the meeting of the American Association I have secured a couple of very young Phlæothrips. My examination of these is not completed, but I have succeeded in demonstrating the single jaw on the left side. The parts are greatly elongated, and remind one of the same organs in Hemiptera. The styliform parts are especially long, extending, when retracted, into the cranial cavity towards the eye, thence bending posteriorly and extending along the posterior wall of the head to the mouth-opening. Both mandible and styliform parts are perforate (or possibly grooved)..

Two unmistakable tarsal claws are present in this genus. From their relation of position to the pads the latter would seem to be modified pulvilli.

Prof. Osborn was much pleased with what Prof. Garman had stated. He had also observed some of the points mentioned in a special study which he had made of these insects, and hoped Prof. Garman would publish his results as soon as possible.

Dr. Weed presented a short paper on the oviposition of *Listronotus latiusculus*. The eggs are laid in clusters of from five to ten upon the leaf stalks of *Sagittaria variabilis*, and are covered with small pieces of the epidermis which are nibbled off by the adult beetle. This was discussed by Messrs. Garman, Fletcher and Webster.

Mr. Charles Robertson, of Carlinville, Ill., read a most interesting note upon the habits of the bee *Emphor bombiliformis*, which was originally described by Cresson as a *Melissodes*, but Paton, in revising the

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genus, raised it to *Emphor*. This bee, it was stated, confines itself almost exclusively to *Hibiscus*, chiefly *H. lasiocarpus*. The appearance and habits of the bee were described. It was stated that in collecting these bees it is important to catch those flying around the plant without alighting, as these were generally the males, whilst those visiting the flowers for honey and pollen were the females. On August 5th, when walking along a dam with water on one side, he had noticed a female standing upon the water; she then flew to a bank, and he observed that she was carrying water to facilitate the excavation of hard ground, into which she was burrowing to build her nest. Sometimes one pellet of earth would be taken out after such an application of water, but at others three or even four. An interesting discussion followed which was participated in by Messrs. Osborn, Cook, Weed, Fletcher and others.

Prof. Osborn read the following note "On a Peculiar Form of Coleopterous larva":—Eleven years ago, while a student in college, I found a peculiar form of larva boring in the twigs of ash trees, and it was described at the time in the students' journal at the college (The Aurora, May, 1879, page 5,) under the caption "A Grub With Legs on its Back." The description is as follows: "The specimen was found boring in the pith of a small twig on an ash tree near the road west of the college, apparently beginning at or near the tip of the twig and working downward. Numerous twigs were found that had been inhabited in this way, but only one specimen of the borer was found—this about a quarter of an inch long, quite slim, and nearly white. Its great peculiarity consists in the disposition of its locomotive apparatus. The first three segments following the head are provided with the usual pair of legs, each in the normal position—that is, on the ventral surface. The following six segments are provided each with a pair of pro-legs, similar to those found on many caterpillars, but, strange to say, these are arranged upon the *dorsal surface*, exactly the opposite of the usual arrangement, while the number six is different from either the caterpillars, where there are four or five, or the saw-fly *larvæ*, which have eight. The remaining three segments have no propellers whatever. The beauty of this arrangement, for the conditions of the borer, can at once be seen, for it has as much foot-hold above as below. Placed upon a flat surface it could make no advancement, but wriggled awkwardly about, evidently seeking its double foot-hold. Placed between two thin plates of glass, it moved rapidly, using all its legs, and

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going with equal facility backward or forward, either side up. If provided with some support at one side it was possible for it to travel by means of the legs on its dorsal surface alone."

During the present season an example of a similar larva has come to my notice, specimens being first observed by Prof. L. H. Pammel, occurring in the stems of *Helianthus*. Their possessing similar locomotive organs upon the back called to mind the peculiar larva noticed years ago. They differ, however, somewhat in colour as well as in the plant on which they occur, and I find that they attacked voraciously dipterous larva that were living in the same stems. Whether they are normally carnivorous remains of course to be determined, but there can be no question of their attacks upon these larvæ, and apparently with the intent of obtaining food from them. These specimens are of a light bluish colour, possessing prolegs upon segments 4-9, inclusive, and a pair of tubercles on the ventral portion of the anal segment, as well as a dorsal tubercle on the terminal portion of the same segment. In general appearance there is a striking resemblance to the *Languria* larva, as shown in figure exhibited by Dr. Weed, but in his drawing there is no indication of the dorsal feet.

The Club convened at 5 p.m., and considered the following resolution :—

Resolved, "That it is the sense of the Club that the meetings of the Association of Economic Entomologists and of the Entomological Club would both be benefited by holding such meetings, if possible, at the same time and place as the meeting of the American Association for the Advancement of Science."

After discussion by Messrs. Fletcher, Osborn, Cook, Alwood, Weed and others, the resolution was unanimously adopted.

The Secretary read a paper by Prof. D. S. Kellicott, of Columbus, O., upon the "Preparatory Stages of *Eustrotia caduca*." He had collected the larva upon *Nuphar advena* at Rives Junction, Michigan, in 1876. From these he had bred a moth, afterwards named by Mr. Grote *E. caduca* in the CANADIAN ENTOMOLOGIST, Vol. 8, p. 207. During July of the present year he had again collected the insect at Corunna, Michigan, and had succeeded in breeding and describing all the stages, which were submitted herewith.

The larvæ found in 1876 were feeding in the fruit, but those studied

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during this summer were found upon the leaves. If these latter were floating, the larvæ were exposed on the upper surface, in other cases they were beneath or concealed in folds. A different habit of swimming to that of *Arzama obliquata*, which progresses by horizontal undulations was noted. *E. caduca* swims strongly, but by an entirely different motion. The posterior third of the body is bent downwards like the tail of a crayfish and then quickly pushed backwards, thus driving the insect ahead by jerks.

Discussed by Messrs. Weed, Webster and others.

Prof. Cook reported having bred *Agrotis C-nigrum* through all its stages upon black currant, the eggs having been laid in a cluster upon leaves of that plant on 1st of June—the perfect insect appearing on the 1st of August.

Prof. H. Osborn read a note on the "Period of Development in *Mallophaga*." The habits of the species of *Mallophaga* render accurate observations upon the time required in development of the eggs a matter of considerable difficulty. While in some of the species upon very common birds it is possible to get an abundance of material, in other cases the opportunities for obtaining such material are very rare. But in the most common species the difficulty of determining the exact time of deposition of eggs, and then of keeping individuals in such conditions as to insure a normal development, makes positive observations difficult. This being the case, any observations which may add to our knowledge of the subject seem of interest, and the present note is offered as one such contribution.

The species chosen in the present case is the *Nitzschia pulicare*, which is almost invariably to be found in abundance on the common chimney swift (*Chætura pelasgia*). This bird is an abundant resident of the building in which my laboratory is located, and being readily obtained on account of its tendency to fly in at the windows, I suggested to Mr. P. H. Rolfs, a graduate student in biology, that he attempt the rearing of larvæ from eggs with a view to determine length of developmental period in connection with studies of its embryology.

For this first purpose he secured on two separate occasions a number of the eggs, and kept them, part in a tight paste-board box, which was kept warm by the heat of his body, the others were enclosed in

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cotton-plugged tubes under a hen that was kept in the laboratory at the time for incubating eggs for embryological work. Of the first lot, all kept in pocket, secured July 27th, two eggs hatched Aug. 4th, five between Aug. 8–13th, one Aug. 16th, the last giving twenty days, the longest period.

Of the second lot secured, Aug. 3rd, six hatched between the 8th and 13th, four hatched Aug. 14th (three in box and one in tube), two Aug. 15th (one in box and one in tube), part not hatching, and the longest period in this case being thirteen days.

Assuming that those requiring the longest time had been deposited but a short time before the experiment began, we should have from fifteen to twenty days as the ordinary time required for the eggs to hatch for this species.

Mr. F. S. Earle presented some interesting notes upon the injurious insects of the season in Southern Mississippi. *Diabrotica 12-punctata* was a very abundant insect, and in addition to its well known food plants it had been a serious pest to peach trees and cabbages. Leaves of the latter, bitten by the insect, at once decayed from the point of injury. Cut-worms were very destructive in gardens, and cucumber and melon vines were much injured by a plant-louse. Potatoes had been much attacked by a black flea-beetle, and the tomatoes by the boll-worm in the fruit, and on the leaves by the sphinx larvæ.

Prof. Cook would like to hear the experience of those present as to a practical remedy for the attack of the boll-worm upon the fruit of tomatoes.

Prof. Osborn said that Mr. Tracy had tried arsenical mixtures with some success, and also had attracted the perfect insects to light.

Miss M. E. Murtfeldt read the following paper:—

SOME EXPERIENCES IN REARING INSECTS.

In rearing insects, as with many other enterprises in life, we climb the ladder to success by the rounds of successive failures, having in many cases to exhaust an almost infinite range of "how *not* to do it," before arriving at its happy converse.

Many and great are the disappointments of the entomologist; but does he succumb? Never! What single point in the biology of a species has been relegated to the absolutely undiscoverable? I do not

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know of one, no matter how obscure the subject or how little advance has yet been made in the direction of its elucidation.

"Hope springs eternal" in the breast of the entomologist, and patience and perseverance have in him their "perfect work," until Nature relents, or is caught "off guard," and the secret, so carefully hidden, is revealed.

I am tempted to enumerate some of the discouraging circumstances encountered by the biologist in this field.

Among the *Lepidoptera*, a majority of the *Bombycidæ*, *Geometridæ* and *Noctuidæ* adapt themselves readily to the conditions of the rearing cage. They accept the food provided and make the best of it, even after it has become a little dry, which must sometimes occur when the caretaker is pressed for time. They thrive in the closer and darker air, and take such exercise as they require within their narrow walls of glass and wire-cloth, and when the metamorphic impulse comes they contentedly weave their cocoons in the corners of their prison, or bury themselves in the two or three inches of cemetarial earth in the bottom of the cage, and safely pass those mysterious transformations which give to this class of beings their pre-eminent interest.

But there is a great deal of individuality, or rather, specificality, in insects, and not infrequently specimens of larvæ are found for which the collector taxes his ingenuity in vain to provide. Not the freshest of leaves, the cleanest swept earth or the most well-aired of cages will seem to promote their development. They wander about the cage with an exhausting activity that pathetically suggests a realization of their imprisoned condition. They nibble languidly at their food, and aimlessly spin mats of web in inconvenient places, over the cracks of the door or cover, for instance, and, before long, comes the morning when they are discovered dead and discolored in the bottom of the cage, *and no more of them to be obtained until another season.* Or perhaps the cocoons are spun or the transformation to pupæ safely effected under ground, and the entomologist has full confidence that in due time he will obtain the much desired imago, and, when it may be expected, watches hourly for its emergence, and is rewarded by the appearance of an *Ophion* or a swarm of *Tachina* flies, or of some still smaller enemy, whose existence he did not even suspect.

Again, the collector may be obliged to delegate his cares temporarily

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to another, who, unused to the almost constant supervision necessary, suffers the precious larva to starve, or, by an oversight, tosses it out with the withered leaves, or crushes it in the hinges of the door, or, still more aggravating, thoughtlessly raises the cover and allows some long looked for imagine to dart out and escape through an open window. All that he will remember for the benefit of the person chiefly concerned, will be that it was a moth and "seemed something peculiar." As the entomologist cannot afford a separate cage for each species, and as he had probably put his choice unknown in with some well known forms of which he wishes simply to increase his duplicates, he probably grasps at the hope that the escaped insect was one of the latter, and so defers the full realization of his loss until weeks and months have passed and all his expected species have emerged, and then he hopes for better success another year, and finds "life well worth living" for this and similar reasons, which only an ardent naturalist can appreciate.

In some respects too much care is as subversive of success as too little. For instance, the very natural curiosity which the student feels to examine into the state of the insect after it has been buried for a short time in the earth. So he sifts the soil in his cage, and though he handles it with all caution, the frail earthen cell in which his treasure is enclosed falls in pieces, and the poor caterpillar in complete helplessness squirms in the loosened earth. Despairingly he tries with clumsy fingers to reinclose it in the fragments of its cell, or attempts to form a substitute by packing the earth so that it may not be smothered. In vain. In ninety-nine cases in a hundred he never sees the imago.

While the hardy pupæ of most noctuids will bear any amount of handling, and by their activity will beat hard the earth about them at any time, a few species absolutely resent the least disturbance. I think that for seven or eight successive years Dr. Riley and I tried in vain to obtain the imago from a beautiful larva found every autumn in greater or less numbers on *Gnaphalium*, and occasionally on the Asters and some other *Compositæ*. Not being able to associate it with its species we designated it the "pretty cut-worm." It was Dr. Riley's practice to have the earth in his cages sifted occasionally during late autumn and winter to see how the pupæ were fareing, and to have each species collected into its particular corner or side of the cage, which was designated by the label on the door.

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But in the case of this particular species this orderliness was fatal. After Dr. Riley went to Washington, I resolved on the "let alone" policy. I put the larvæ into a cage with clean earth with an admixture of sand which I dampened slightly and only at considerable intervals during winter, kept the cage in a very cool place, and the next summer was rewarded with several fine specimens of *Mamestra legitima*, my only disappointment being that it was a species by no means uncommon.

With me *Scopelosoma sidus* behaved in an almost equally capricious manner, but was, after many trials, finally reared by adopting the same methods as with *legitima*. I now make it a practice to sift or change the earth in my cages only in the spring and autumn before the hibernating pupæ are formed. Of course, if I wish to note pupal characteristics, I have to run the risk of the disturbance, but this is only occasional. I have found that frequent dampening, when the cages are kept in doors, is also detrimental, and that hibernating larvæ and pupæ are far less likely to suffer from drought than from dampness.

In rearing the Micro-lepidoptera—in which I have an especial interest—various tactics must be pursued, and the imagination is often vainly taxed to suggest a provision which the delayed changes and general unrest of the insect plainly call for.

Under natural conditions it is very difficult to keep track of these small creatures. The leaves or flowers or fruits on which they may be found feeding on one day will be deserted by the next, and during the darkness they will have betaken themselves to parts unknown, the most assiduous search failing to discover them. In the rearing jar some species adapt themselves very kindly; others will crawl about for days spinning threads of silk over sides and cover and finally dry up without effecting their transformations.

An accident to which the student is liable, and against which he can with difficulty make provision, is to have the larva, which he has perhaps just described and figured, escape. How often have I taken up a bottle in which I had been rearing a particularly precious unknown, and found a tiny hole in the muslin cover, or perhaps a little flap cut at the edge of the bottle, telling only too surely of the loss and delay which a further examination verified. The annual brooded species which appear in the spring are the *beteis noir* of the Micro-lepidopterist, especially such

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species as pupate on or just beneath the surface of the ground. They have to be cared for during the long, hot summer, as well as the autumn and winter, and to keep the safe middle course between the Scylla and Chaybdis of drought and of the dampness which would promote the equally fatal mould, requires the most careful attention. The annual brooded species which later fold or mine the leaves, or feed in the fruit capsules of various plants, or bore the stems, are comparatively easily reared, with a few exceptions. It was a number of years before I succeeded in obtaining the moth from an interesting larva which fed in the capsules of *Pentstemon*. This was owing to the peculiar change of habit during hibernation. After eating all the seeds from both divisions of the capsule, it would thoroughly line one all with silk, after cutting an aperature for escape, and ensconce itself, as might reasonably be supposed, for its winter's sleep. But no; the neatly lined cell was only a temporary abode, which, during the inclemency of mid-winter, was to be deserted for an entirely different one. Where, in the state of nature, I have not yet been able to discover. In my rearing jars it perished, year after year, to my inexpressible disappointment, until finally I wintered a number out of doors in a small wire cloth box closed with a cork. From this collection I at last obtained the moth—a beautiful *Conchylis*—from a larva that had bored into and transformed within the cork. But for two or three years I had only the single specimen, and next to the aggravation of utter failure I rank the possessor of an unknown unique. It may be new, and if sent to a specialist he will generally feel somewhat aggrieved if you reserve the right of description and further impose upon him the duty of returning the specimen. Then there is the danger of its destruction, either in the mail or express, to be braved, and yet, so long as one does not know the species, or be assured that it is new, one never can take full satisfaction in having bred it.

Last year I had the satisfaction of obtaining nearly a dozen imagines of the *Conchylis* in question by providing a number of bits of pith and cork in which the larvæ bored after their desertion of the capsules where they had fed.

Wherever I can make satisfactory arrangements for keeping track of them, I winter my Micro-larvæ and pupæ out of doors. Such species as bore the pith of stems are very easily cared for, and leaf miners and webbers I enclose on the surface of the ground, in some sheltered situa-

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tion, under wire sieves or covers, bringing them in in the spring in order to have the little moths emerge where they can more easily be chloroformed or transferred to the cyanide bottle.

I must confess that I have never had signal success in rearing such species of the *Tenthredinidæ* as transform under ground. I have in mind more than a half dozen species—the larvæ of which are most interesting—of which I have so far failed to obtain the imagines, in spite of my utmost care.

The leaf and root-feeding beetles have always developed satisfactorily for me, but the *Cerambycidæ*, which feed on growing wood, have given me much trouble, and, in many cases, failed me utterly.

Orthoptera require but little care, as also do leaf-feeding *Hemiptera*, but the Cannibal species of both these orders are more difficult to cater to, and often refuse a diet that one would think would be irresistible. This is especially true of the carnivorous bugs which I have found require large space and ample provision to preserve them from fraternal rapacity.

With the aquatic orders I have had but little opportunity for experiment, but think they must furnish many very interesting subjects.

I believe that costly insectaries are being constructed by many entomologists, and no doubt will afford room for much thorough study of forms and habits. But such costly appliances are not absolutely necessary, and sometimes make observations more difficult than when the conveniences are more primitive.

A secure enclosure, fresh food, fresh air and clean water in the bottles are almost the only requisites in rearing the herbivorous species, and the more constantly the cage or jar is under observation the more thoroughly of course are the history and habits of the species revealed to us. When I wish to know all about a species, I keep the cage or jar on one corner of my desk and watch its occupant in the intervals of other work.

I cannot hope that I have conveyed much information in these notes to those who have gone over the same ground, but I am at least sure that I have recounted some of the experiences of every biological student of insect life, and can sympathise in his disappointments and appreciate the satisfaction of his successes.

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Friday, August 22nd.—The Club met at 8.30 a. m. Dr. Weed presented a short paper on the habits of *Lixus concavus*.

As reported in the bulletin of the Ohio Ex. Station, Mr. Alwood had found this insect injuring the stems of rhubarb. During the past summer he had bred it from all parts of the stem of the common curled dock.

Prof. Alwood stated that he had observed the larvæ of *Gortyna nitela* eating those of *Lixus*.

Dr. Weed read a paper upon the habits of *Psephenus Lecontei*.

Prof. Webster and Mr. Fletcher also spoke on the habits of this beetle.

Prof. Hargitt read a note upon a large foliaceous gall which destroyed the tips of the stems of various species of *Solidago* at Bloomington, Indiana. In many instances as many as ninety-nine per cent. of the flower stems had been destroyed.

Prof. Hargitt read a note upon the Canker Worm. He said: "My attention was drawn to an orchard near Oxford, Ohio, which, for three or four years, had been seriously affected by this pest. In May, 1890, I went to examine the orchard and found it thoroughly over-run by the larvæ, many of the trees being actually dead, and several others in a very weak condition. The orchard, viewed at a distance, had the appearance of having been burned, the leaves being brown and dead. The trees were most attacked upon the outer rows, particularly those adjoining a wood. I recommended spraying with one of the arsenites, but it was too late for the present season. I observed several small birds in the orchard actively engaged in feeding upon the larvæ, amongst them the cedar bird, blue bird, summer warbler, chipping sparrow and field sparrow."

Prof. Hargitt also read a note upon *Cermatia forceps*. He had found that this Myriapod had become abundant in houses and the college building at Oxford, Ohio, during the past two or three years. He had experienced the same difficulty in keeping the insects alive in captivity, as was mentioned by Dr. Lintner in his 4th Report. He had succeeded in keeping them for several days and inducing them to take prey by keeping them in dark quarters in a tin canister during the day. When so confined they had fed freely upon house-flies, and other insects supplied them.

Prof. Webster spoke of the predaceous habits of *C. forceps*, and its special fondness for the Croton-bug *(Ectobia germanica)*.

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Mr. Fletcher had observed the insect when visiting Mr. Howard at Washington, D. C., who had described to him its remarkable habit of capturing the Croton-bug by springing over it and thus encaging it beneath its many curved legs. He was of the opinion that those who had failed to keep this insect in captivity had done so from omitting to supply a sufficiency of moisture, and thought that Mr. Hargitt's success in the instance mentioned, where the insect was put in a tin can, was more due to this cause than to the darkness. *Myriapods* are generally found in damp, dark places.

The Club proceeded to elect officers for the ensuing year. Prof. Cook, the retiring President, congratulated the members upon the harmony which had existed throughout the sessions, and was glad to find that, although some old and pessimistic members of the Club had predicted that it had run its course and would soon flicker out like a spent candle, he was glad to find that the present meetings had not only been the best attended for many years, but that the discussions and papers had been equally interesting to those of any meeting which he had had the pleasure of taking part in. He wished the Club every success and trusted that it would grow stronger and stronger every year. The following officers were elected :—

President, Prof. Herbert Osborn, Ames, Iowa.

Vice-President, Miss Mary E. Murtfeldt, St. Louis, Mo.

Secretary, Dr. C. M. Weed, Columbus, Ohio.

Prof. Osborn, at the invitation of the President, introduced the subject of the use of contagious diseases in combating injurious insects. He said that he had already published a paper in the Transactions of the Eastern Iowa Horticultural Society for 1886, pp. 400–405, upon this subject; but that it was of such importance that he desired to hear it discussed by the members of the Club. He first mentioned the well-known fungous and bacterial diseases which attack insects, as Muscadine, Grassen or Jaundice, Pebrine, Flacherie or Flaccidity, Foul-brood of Bees, Fly and Grasshopper Fungus, and the White-grub Fungus, and called attention to the fact that we were already able to control those which affect important domestic species, as Silkworms and Bees, and that to some extent at least we are able to control those available as agents in destroying

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injurious species. After considering the various conditions limiting the applicability of this means, he drew the following conclusions :—

(1) That there are diseases amply sufficient as a basis for economic work, the bacterial forms giving the most promise for all cases where early results are desired, while those due to fungi, so far as present knowledge goes, propagating slowly, can only be used as slow but efficient checks to injurious forms, the most that we can do with them being to introduce them in localities where they are not already found.

(2) That the diseases can be controlled to the extent of preserving the germs for a season and transporting them from place to place to use for inoculation, but that their spread in nature will be affected by conditions beyond control, while only such insects as occur gregariously, or live in mingled hosts, can be attacked to advantage.

(3) That the cost of application would prevent its adoption except in certain forms.

(4) That we must consider this method of contending with insects at best as but one of a number of profitable methods to be used in certain cases where other methods are insufficient, and to supplement other methods when it can be done to advantage. With this end in view, the diseases of insects are worthy of the most careful study, and will not, he thought, disappoint the investigator in their final results.

Mr. Fletcher thought that the chief difficulty with regard to these fungous diseases was their cultivation so that they might be available at the time when needed. One trouble with him had been carrying them over the winter.

Prof. Hargitt spoke of a fungous disease which had attacked the canker worm.

Prof. Cook thought the greatest difficulty in making use of contagious diseases for the destruction of insects was the fact that the insects which it was desired to treat were not always in a susceptible condition.

Prof. Garman thought that although fungous diseases were difficult to introduce, bacterial diseases would probably be more controllable.

The meeting adjourned till 5 o'clock.

Prof. Atkinson spoke on the "Injurious Insects of Alabama." A bud worm had been extremely injurious to young corn, piercing the central shoot and destroying its growth. *Diabrotica 12-punctata* had

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also been injurious in the same manner; and, if there were not sufficient food in the stem, the larvæ descended to the roots and tunnelled out irregular channels on the surface. They pupated in the ground. A new attack had been observed on the "Irish potato," viz, by the Cabbage Plusia, which had attacked the leaves. The same insect had been very injurious to cabbages. In the Southern part of the State more harm had been done by the Plusia than by the cabbage worm. At Mobile farmers had complained that 50 per cent. of their melons had been injured by a worm. *Scolytus rugulosus* had been very abundant at Auburn in the spring, attacking trunks which appeared to be perfectly sound. Onions had been badly injured by a species of Thrips. Another species had also been injurious to cotton plants.

Prof. Cook stated that he had also seen a Thrips injuring onions in Michigan.

Prof. Webster stated that he had studied *Scolytus rugulosus* and had found that it invariably attacked trees which were injured. In a single instance, where the beetles had commenced operations on a sound tree, he found that they afterwards left it.

Prof. Cook made some remarks upon the effect of mild winters upon insect presence. He had found cut-worms and saw-flies very abundant in Michigan during the present season. He had also bred a new borer from the black currant, *i. e.*, the small longicorn beetle *Hyperplatys maculatus*. He had also found that the larvæ of *Aegeria tipuliformis* had been largely destroyed by a fungous growth like that of the white grub. The leaves of cherry, pear and quince had been badly attacked by the larvæ of saw-flies, but they had been easily kept in check by applications of road dust.

Dr. C. M. Weed presented a paper upon the "Oviposition of *Dectes spinosus* upon *Ambrosia trifida*." He also gave some account of the insect, in all its stages, from specimens which he had bred.

During the meeting a most interesting set of photographs was exhibited by Prof. Webster, showing a likeness of Thomas Say, his birthplace, the house where he lived during the greater part of the time he was writing his works, his tomb and an autograph. Prof. Webster had a few sets of the photographs struck off when his own were printed and is willing to let entomologists have them at the actual cost of production.

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PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 208, Volume xxii.)

H. roseata Wlk.

1866—Wlk., App. to Lord's Trav. in Vanc., 336 (?), *Halisidota.*

cinnamonea Bdv.

1868—Bdv., Lep. Cal. (Ann. Soc., Belg., XII.), 80, *Phægoptera.*

1869—Grt. & Rob., Trans. Ann. Ent. Soc., III., 175, *pr. syn.*

Habitat—Vancouver, Calif.

As the description of this species is not readily accessible to students, I reproduce it here :—

"Female rosy red; body densely clothed, and partly pale yellow beneath; head with a pale yellow band on the front; palpi extremely short; thorax with six longitudinal pale yellow streaks; abdomen rosy, lanuginous and partly yellow to the base, extending much beyond the hind wings; fore wings with some pale yellowish streaks toward the base, with three exterior whitish macular, very oblique bands; spots mostly cuneiform; costa straight; tips slightly acute; exterior borders slightly convex, extremely oblique; first and second inferior veins contiguous at the base; third very near the second; fourth remote from the third; hind wings whitish cinereous, slightly hyaline; veins and fringe slightly yellowish. Length of the body, 7 lines; of the wings, 20 lines.

"This species may form a new genus. It differs somewhat from *Halisidota* in the structure of the veins of the fore wings."

H. scapularis Stretch.

1885—Stretch, Ent. Amer., I., 106, *Halisidota.*

Habitat—New Mexico.

H. significans Hy. Edw.

1888—Edw., Ent. Amer., III., 182, *Halisidota.*

Habitat—New Mexico.

H. sobrina Stretch.

1873—Stretch, Zyg. and Bomb., 87, 135, pl. VI., f. 10, ♂, *Halisidota.*

1873—Edw.*, Proc. Cal. Ac. Sci., V., 369, *Halisidota.*

Habitat—California.

Food-plant—*Pinus insignis.*

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H. tessellaris Sm. Abb.

1797—Sm. Abb.*, Ins. Ga., II., 149, pl. 75, *Phalæna.*
1816—Hbn., Verzeichiss, 170, *Halisidota.*
1837—Geyer, Zutr., No. 470, ff. 939-940, *Halisidota.*
1833—Harris, Cat. Ins., Mass., 592, *Arctia.*
1841—Harris*, Rept. Ins., Mass., 260, *Lophocampa.*
1856—Wlk., C. B. Mus., Lep. Het., III., 732, *Halisidota.*
1860—Clem., Proc. Ac. Nat. Sci., Phil., XII, 534, *Halisidota.*
1862—Morris, Synopsis App., 348, *Halisidota.*
1862—Harris*, Inj. Insects, 364, *Lophocampa*
1863—Saund.*, Syn. Can. Arct., 19, *Halisidota.*
1864—Walsh*, Proc. Bost. Soc. N. H, IX., 289, *Halisidota.*
1870—Walsh*, Am. Ent., I., 205, *Lophocampa.*
1873—Stretch*, Zyg. & Bomb, 87, 137, pl. VI., f. 9, ♀, *Halisidota.*
1882—Grote, New List, 16, *Halisidota tessellata.*

antiphola Walsh.

1864—Walsh*, Proc. Bost. Soc. N. H., IX., 288, *Halisidota.*
1864—Walsh*, Proc. Ent. Soc., Phil., III., 412, 413, *Halisidota.*
1864—Grt., Proc. Ent. Soc., Phil., III., 536, *pr. syn.*
1865—Walsh, Proc. Ent. Soc., Phil., V., 197, *pr. syn.*

var. harrisii Walsh.

1864—Walsh, Proc. Ent. Soc., Phil., III., 430, *Halisidota.*
1865—Walsh, Proc. Ent. Soc., Phil., V., 197, *pr. var.*
1870—Walsh, Am. Ent., I., 205, *Lophocampa,*
1873—Stretch, Zyg. and Bomb., 137, *pr. var.*

Habitat—Canada to Texas; Illinois, Indiana, Missouri.
Food-plants—Oak, sycamore, beech, hornbeam, plane.

H. trigona Grt.

1879—Grt., No. Am. Ent., I., 46, *Halisidota.*
1881—Grt., Trans. Kans. Ac. Sci., VII., 64, *Halisidota.*

Habitat—New Mexico.

Genus EUHALESIDOTA, Grt.

1865, Grt., Proc. Ent. Soc., Phil., V., 243.

Head moderate; eyes large, not prominent; tongue of medium length, corneous; palpi short, scarcely exceeding the front; terminal joint very short; antennæ long, in the male heavily pectinated; legs increasing in length posteriorly; spurs normal in number and moderate in length.

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In venation I can find no notable differences from *Halisidota*, and the only examined species, *longa*, alone considered, I cannot find *any* difference save in the wing form. In *Euhalisidota* the primaries are longer and more pointed. Mr. Grote, in describing the genus originally, had only a single rubbed female before him, and pointed out some distinctive characters which seem inconstant.

E. longa Grt.

1880—Grt., CAN. ENT., XII, 213, *Euhalisidota*.

Habitat—Florida.

E. pura Neum.

1882—Neum., Papilio, II., 133, *Euhalisidota*.

Habitat—Arizona.

Genus ALEXICLES, Grt.

1882—Grt., Trans. Kans. Ac. Sci., VIII., 46.

Eyes hairy, head produced; the thick clypeal vestiture conceals the small palpi; abdomen short, male antennæ pectinated; wings rather long and narrow, entire, sub-diaphanous. Cell in primaries closed, veins 3–5 arising near together.

The above genus is unknown to me, and the characters given are from Mr. Grote's description, and all that he gives. He says, "In placing it among the *Arctians* I have probably not found its best place." No family characters are given, so it is impossible to guess where the genus belongs. The neurational characters given are as much *noctuid* as *arctiid*, while the origin of vein 8 of secondaries, which would have probably decided the propriety of its reference to the *Arctians*, is not mentioned at all. In fact, except by the identification of the species, the genus is not recognizable. The species is *A. aspersa* Grt.

1882—Grt., Trans. Kans. Ac. Sci., VIII., 46., *Alexicles*.

Habitat—New Mexico.

I have now gone over all my notes in the family. The bibliography is probably not complete, but it embraces references to the descriptions of all the species and nearly all the genera. By far the greater number of references are original, and nearly all have been verified. The notes on the structural characters have gradually accumulated, as I rarely lost an opportunity of making an examination of a species coming into my hands, nor of noting the contents of books which I found occasion to examine in my studies on the *noctuidæ*. In arranging the *Arctiidæ* of

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the National Museum collection it became necessary to examine some of the species for determination, and the facts gleaned in this way were noted. The localities given are very incomplete, as here I failed. I neglected localities for structure, and the list does not, therefore, give a fair idea of the distribution of many of the species.

The economic literature has been almost entirely omitted, since it rarely became necessary for me to refer to it. Mr. Hy. Edwards's list of the early stages will supplement the present catalogue in this respect. The object sought here is to bring within reach of the student the knowledge of where the literature of the family can be found, if he desires to study it systematically. I have also given my own observations which may serve as a starting point for others, and may aid in determination and a knowledge of the characters upon which the genera are based.

SYNOPSIS OF GENERA.

1. Front tuberculate or roughened 2
   Front smooth 3
2. Anterior tibia unarmed; accessory cell wanting.....*Cydosia*
   Anterior tibia with a claw at tip; primaries with an accessory cell.....*Cerathosia*
3. Vein 5 of secondaries wanting or very faint..... 4
   Vein 5 of secondaries present..... 5
4. Primaries long and narrow, secondaries broad and large....*Emydia*
   Primaries broad, secondaries smaller, proportionate .....*Crocota*
5. Vein 8 of primaries wanting; 11 veins..... 6
   Vein 8 of primaries present; 12 veins 7
6. Vein 10 of primaries from the subcostal; 3 and 4, and 6 and 7 of secondaries stalked.....*Gnophæla*
   Veins 7 to 10 of primaries on a stalk out of the end of the cell; veins on secondaries not stalked.....*Epicallia*
7. Vein 10 of primaries from the subcostal 8
   Veins 7 to 10 of primaries stalked out of the end of cell.....13
8. Accessory cell present on primaries..... 9
   Accessory cell wanting on primaries.....10
9. Antennæ of ♂ bipectinated.....*Nemeophila*
   Antennæ of ♂ with single lateral bristles only.
   Primaries narrower, parallel, apices rounded; secondaries large, broad .....*Utetheisa*

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Primaries broader, trigonate, apices marked; secondaries proportionate ..... *Callimorpha*

10. Tongue weak and short 11
Tongue moderate or long 12

11. Fore tibia with a small spine at tip, wings broad and large.. *Euprepia*
Fore tibia unarmed.
Wings broad, size large ..... *Platarctia*
Wings moderate, size smaller ..... { *Arctia* / *Callarctia*

12. Primaries broad, apices not produced, secondaries proportionate ..... *Euchætes*
Primaries broad, apices produced, acute, secondaries small ..... *Eupseudosoma*
Primaries narrow, with greatly produced apices, secondaries still smaller ..... { *Halisidota* / *Euhalisidota*
Primaries still narrower, size smaller ..... *Nelphe*

13. Vein 8 of secondaries wanting ..... *Euerythra*
Vein 8 of secondaries present 14

14. Median spurs of hind tibia wanting 15
Median spurs of hind tibia present 18

15. Anterior tibia armed at tip 16
Anterior tibia unarmed at tip 17

16. Tibial armature consisting of a long claw ..... { *Seirarctia* / *Ectypia*
Tibial armature consisting of a stout spine each side of tip; ♀ antennæ pectinated ..... *Leucarctia*
Tibial armature consisting of a small spine at each side of tip; ♀ antennæ simple ..... *Hyphantria*

17. Primaries broad and obtuse, secondaries proportionate .... *Leptarctia*
Primaries long, apices acutely produced; secondaries small, caudate ..... *Ecpantheria*

18. Antennæ of ♂ pectinated 19
Antennæ simple in both sexes 20

19. White species with more produced apices ..... *Spilosoma*
Tawny species with broader, more obtuse wings ..... *Antarctia*

20. Primaries narrow, elongate, apices acute; secondaries rounded; vestiture dense; color tawny ..... *Pyrrharctia*

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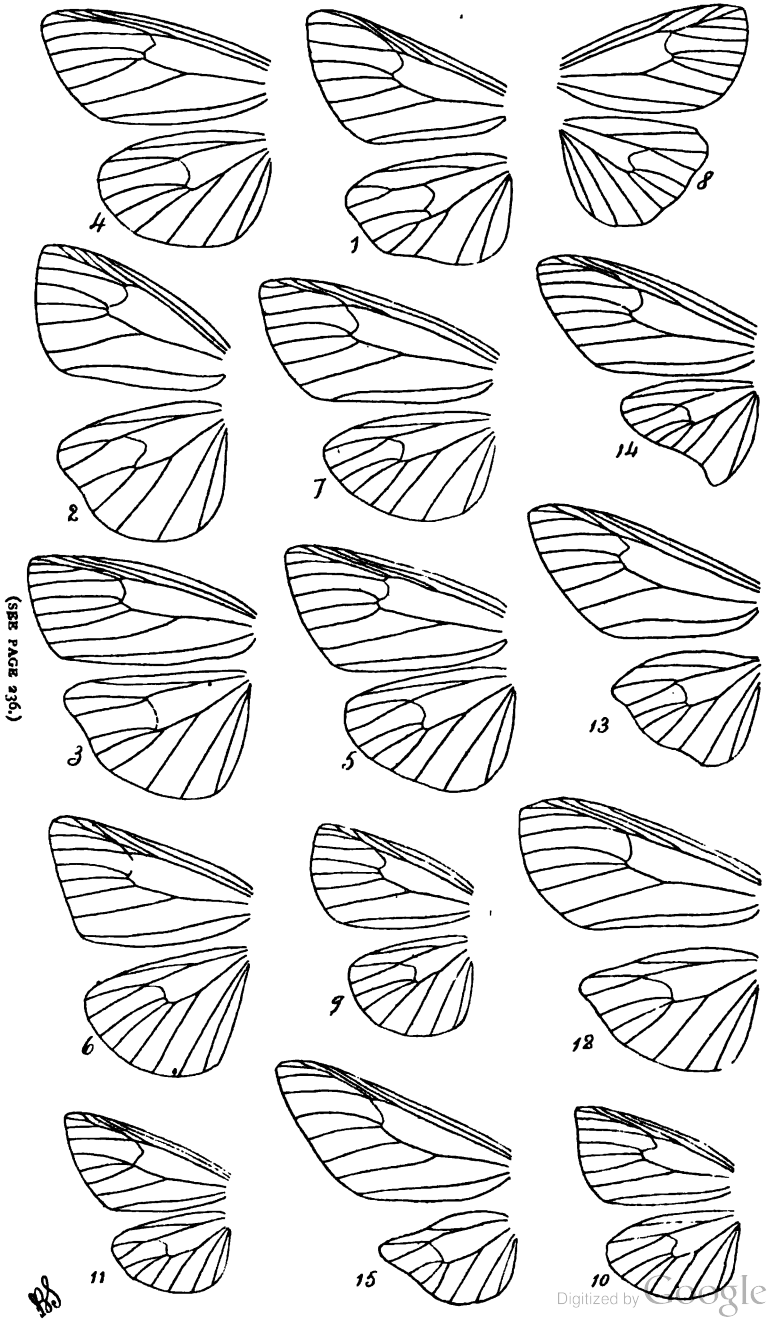

(SEE PAGE 236.)

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Primaries broader, apices marked, but hardly acute; vestiture thin; color reddish..... *Phragmatobia*

Primaries still broader, apices long acute; secondaries subcaudate; size large ..... *Arachnis*

The synopsis shows plainly the close relation of some of the genera, though the series is arbitrary in its arrangement. Excluding the *Cydosiinæ*, which perhaps indicate a tendency to the Noctuidæ, we have two fairly distinct series. In the one we find a usually small head, somewhat retracted, and more or less obsolete tongue. The antennæ are moderate in length or short. In the other series, the head is larger, more free, the tongue stronger and longer, and the antennæ are usually longer and more prominent. The position and origin of vein 10 serves as a good basis of division, and this corresponds to some extent with the other characters. The entire family needs further revision. The genera allied to *Arctia* are scarcely sufficiently distinguished, and so *Euhalisidota* seems scarcely distinct from *Halisidota*.

Melanchroia, *Daritis* and *Kodiosoma* are not included in the synopsis. *Ectypia* and *Nelphe* are placed partly by guess, from lack of types for examination.

Eupseudosoma has been sent me by Mr. Conradi, and is a close ally of *Halisidota*, differing in the broader primaries, and very long oblique outer margin.

Finally, the present paper consists rather of a series of notes preparatory to a study of the family, than a critical study. With a good collection at hand, there should be no difficulty anywhere in the family, except perhaps in *Halisidota*.

EXPLANATION OF PLATE.

1. Venation of *Gnophæla hoppferi*.
2. " " *Crocota ferruginosa*.
3. " " *Utethesia bella*.
4. " " *Epicallia virginalis*.
5. " " *Euprepia caja*. *Arctia* does not differ.
6. " " *Nemeophila*.
7. " " *Seirarctia echo*. *Leucarctia* and *Pyrrharctia* do not differ.
8. Venation of *Phragmatobia rubricosa*.
9. " " *Antarctia vagans*.
10. " " *Spilosoma virginica*.
11. " " *Hyphantria textor*.
12. " " *Euchætes egle*.
13. " " *Arachnis picta*.
14. " " *Ecpantheria scribonia*.
15. " " *Halisidota caryæ*.

Cydosia and *Cerathosia* were figured in the Proc. U. S. Nat. Mus. for 1888; *Callimorpha* and *Euerythra* were figured in the same publication the year previous.

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NOTES ON COLEOPTERA—NO. 6

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Corymbites nigricornis Panz. (*metallicus* Payk. *nitidulus* Lec.) This species is widely distributed in North America, from Hudson Bay to Massachusetts, and westwardly to the Rocky Mountains, through which it extends to New Mexico. It also inhabits Siberia, Central and Northern Europe. The typical form (European) is described as metallic black, with the two basal joints of the antennæ and the feet rufous. The American forms found in Northern Michigan and at Sudbury, Ontario, agree with this description, except that I have seen no example with more than the first basal joint of the antennæ rufous. Moreover, specimens occur with the hind angles of the thorax rufescent, and the feet varied in different ways from rufous to entirely brown. From the more southern parts of Canada and from Massachusetts comes a form with a narrow margin and the hind angles of the thorax, its inflexed sides, the prosternal lobe, the epipleura of the elytra, sides of the abdomen and narrow posterior margin of the ventral segments rufous; the feet varying in colour, as in the typical forms.

Except in colour there appears to be no other separative, but this is so striking that it is not obvious, without some study, that the forms are all one thing. No such variation seems to have been recorded among the European forms.

Petalium bistriatum Say.—This is a very small thing, from .04 to .08 inch in length, black, with rufous feet and antennæ, and is frequently beaten from bushes by the collector. There is a form raised abundantly from dead hickory of two years, that is entirely castaneous, with the other characters noways different, except that the dorsal striæ of the elytra are fairly well marked, the intervals with rows of fine soft hair, and the 8th joint of the antennæ, though still short, can be seen in life with a lens; whether this is sufficient difference to be the basis of another species is left to the future monographer. The genus is readily known from all others in this difficult family by the large metasternum projecting forward separating widely the middle coxæ, and by the second ventral segment of the abdomen being as wide as the remaining three conjointly. The insects of this family have a very provoking habit of tucking away the antennæ and folding the legs so as to elude observation without a trouble-

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some process. I find it very satisfactory to collect them alive and to place them on the slide of the microscope in a drop of chloroform, which quiets them for a minute, and when reviving the antennæ and legs are extended slowly and may be seen rather better than by dissection.

Raised from the same wood with the above was a specimen of *Hadrobregmus* .18 inch long with eleven jointed antennæ, which if not *pumilus* is a new species, the size constituting the principal difference observed.

Several examples of *Xyletinus peltatus* were likewise bred from this wood.

Purpuricenus axillaris Hald. (Tr. Am. Phil. Soc., X., 31).—This fine species is not uncommon here, and this season numerous examples were bred from hickory wood deadened two years and one-half ago. In the catalogue it is set down as a variety of *humeralis* Fab., but the reason is not very obvious. It is smaller, .45 to .65 inch, (Haldeman gives, .50 to .75 inch, but in over 100 examples I never saw one over .65 inch, .50 to .55 inch being the usual length); cylindrical in outline; thorax moderately foveate-reticulate; elytra sparsely moderately punctured on the basal third, which is mostly of a pale lemon color to orange yellow; the apical two-thirds is entirely black, the anterior portion of which is punctured a little more finely than the yellow portion, and the posterior very finely and densely; a black hair arises from each puncture forming a dense pile that completely conceals the punctuation; the underside is moderately finely sparsely punctured; the black and the yellow portions of the elytra are separated transversely by an irregular border, though the black has no tendency to advance along the suture, but rather the reverse.

Humeralis is larger, .70 to 1.00 inch, considerably depressed and broader in proportion to the lengths; the thorax is very rugosely foveate-reticulate; the elytra on basal third are coarsely sparsely deeply punctured; the punctures on the apical black part are somewhat finer but not dense, and are not concealed by the black hairs; the underside is coarsely punctured; the apical black of the elytra advances normally along the suture to the scutellum, leaving a triangular basal space on each side extending to the marginal third of a bright scarlet color, but sometimes orange. In some individuals the basal spot becomes dilated posteriorly so as to be separated only by a black sutural line, and then the specimen

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resembles *axillaris*, but only in coloration. To me they are separate species.

Dorcaschema nigrum Say.—This species requires two years for development, breeding in dead hickory limbs, from a barrel of which more than 500 specimens were obtained from June 3rd to 25th. The larvæ live under the bark till May of the year in which the beetle appears. As the time for pupation approaches they develop an enormous appetite and eat broad cavities in the wood under the bark through which their dust is ejected by a perforation. Some of them pupate in these cavities in which they partition off a suitable space with a wall of compacted dust; but the greater number bore obliquely into the wood to a greater or lesser depth and distance and then outwardly again till near the surface, packing their burrows solidly. The larvæ do not bore entirely to the outside, but stop short one-eighth to one-sixteenth of an inch, leaving the remainder of the wood and the bark to be cut through by the matured beetles, which are just as capable of boring a hole as the larvæ. And in this connection I would state that I have ascertained this season that in the case of Saperda Fayi and S. concolor, the beetles, and not the larvæ, bore the holes to escape by. In the pupa state the very long antennæ are coiled into a spiral of three and lie on the wing pads. In the development probably one-fourth of the beetles are unable to free the entire antennæ from the envelope and appear with one or both deficient in some of the external joints.

Tymnes metasternalis Crotch.—This species appears to be rare among collectors. Crotch described it from Illinois briefly: "Very similar to the preceding [tricolor, the bronze variety], but elytra more sparesly punctate, subcostal; metasternum and ventral segments closely and deeply punctate. L. .22 inch." This season I took twenty-five examples of a form that suits this description well enough, except that in length they measured from .16 to .19 inch, which represents a much smaller insect, but which for the present may bear the name. In *tricolor* the metasternum is scarcely sparingly punctate and highly polished, and there are scarcely any abdominal punctures. This, with the much larger size and more convex form, are sufficient distinctions. With *Rhabdoptera picipes* Oliv. (*Colaspis prætextata* Say) it may be very readily, and probably is, often confounded, as they are nearly of the same size, colour and sculpture, but the underside of *picipes* is smooth like in *T. tricolor* and the tibiæ are not

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produced at the apex to a point. The beetles were beaten from a small *Cratægus* growing in a fence corner at the edge of a large grove on June 2nd, 6th and 12th, many of them paired; other bushes of the same species nearly yielded none. *Tymnes tricolor* is rather abundant, varying in the colour and sculpture of the upper side; the bronze coloured is the largest and roughest, occurring in June and July, usually on chestnut; the green variety is found at the same time on hickory, individuals being sometimes bright blue and an occasional one bright coppery. I once took two of the green variety early in April in hibernation, though this is probably an exception to its habit.

Tymnes chrysis Oliv.—This species when found is abundant, but it seems to occur in localities. So far, it has been taken on hickory sprouts growing from stumps, and occurs in June and July. As it has not been described in American works I give a translation of Olivier's: "*Golden-green, thorax and elytra punctate; antennæ and feet rufous.* Like *T. viridis;* antennæ, palpi, labrum above and feet rufous; body green or brassy-green. Sometimes brassy-green, brilliant, shining; head, thorax and elytra punctate. New York, Georgia." Oliv., Vol. 6, 886, No. 16, and figure. *T. viridis* Fab. is the green form of *tricolor*, which is more brilliant in the Southern States, whence were Olivier's specimens. Olivier's description is applicable as far as it goes, but a greater abundance of material shows more variation. The large majority of examples are greenish blue to cobalt blue, while violaceous and bright coppery individuals occur; in some examples the thorax is of one of these colours and the elytra of another; the antennæ are often darker outwardly; the femora are usually piceous black, with the tibiæ and tarsi pale. This is varied in different ways, and sometimes all are piceous. The underside is black or piceous, shining, sparsely, finely and irregularly punctate. Length .18 to .20 inch. This species has the thorax and elytra smooth and rather closely and evenly punctate, and without the elytral rugosities of the other species, and arranged by this character it would be the first or the last of the series.

Rhabdoptera (Colaspis) picipes Oliv. (*prætextata* Say).—Olivier describes his *picipes* as having the thorax *finely* punctured, and as being a little *larger* than *Tymnes* (*Colaspis*) *viridis* Fab., the green variety of *T. tricolor*. It is difficult to find a North American insect in full accord with this description if rigidly interpreted. The bronze form of

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T. tricolor with which it has been united has the thorax not very coarsely but still not finely punctured, and in this respect does not quite answer, though usually a little larger than *viridis*.

Rhabdoptera prætextata Say, with which Dr. LeConte formerly united it, and more recently Dr. Horn, with the precedence, has the thorax punctured as in *tricolor*, and is too small by nearly one-half. Olivier's description translated is: "*Beneath piceous; above shining, fusco-æneus; antennæ testaceous, apex black, a little larger than C. viride* Fab. Antennæ testaceous, last two joints fuscous; body above shining, beneath piceous; thorax finely punctate; elytra punctate with confluent punctures. Throughout Carolina." A figure accompanies this description.

This is as good a description of the bronze form of *tricolor* as Olivier gives of either *viridis* or *chrysis*, and as the same exactness of expression did not prevail then as now, the really not very coarsely punctured thorax might have been considered fine by him. It seems scarcely just to Mr. Say to supercede his name, accompanied by a fairly good description, by one that, according to the describer, applies to an insect nearly twice the size and which, like a hermit crab, has been wandering about a long time in search of a suitable shell. In neither of the two species are the elytra confluently punctured. This species is distributed from Canada to Florida and westward to the Rocky Mountains. It occurs here abundantly on the *Vitaceæ*, especially the wild grape.

There is an undescribed species of *Colaspis* or *Rhabdoptera* (if the genus is valid) found in North Carolina, of which I have examples, which is of the proper size to suit the description of *picipes*, has the elytra what may be termed rugosely punctured, and the thorax scarcely more coarsely than *tricolor* or *prætextata;* but it is brilliantly green above. There may, however, be examples, as in nearly all similarly coloured insects, of bright golden or coppery individuals, and if so, it would fit Olivier's description better than either of the other species. There is a difficulty that must be met, or satisfactorily explained, before there can be certainty in any assignment, that is; the name "*picipes*," and the statement that the underside is "*piceous*." Olivier, in describing the other species, names the colour of the legs, which he here does not do, and the legitimate inference

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with the name given is that he had before him an insect with dark legs, which neither of the species mentioned nor the nondescript has, and with little tendency to in any individual observed. Possibly the insect described may belong to some foreign country.

Haltica ignita Ill.—This species is so protean in colour, form and in the wide range of the vegetation it affects, that it is difficult to believe all the forms included under this name really belong to one species till one looks for tangible structural differences. It has a very extended distribution, from the Hudson Bay region to Florida and Texas, and was described by Dr. LeConte, from Fort Simpson, on the McKenzie river, under the name *inærata*. It is easily separable into at least three races, two of which occur here in the greatest abundance. The first is the typical form, having the upper side of a brilliant golden-copper colour, though individuals occur with it violet or green. It is found during May on Azaleas growing among huckleberry. A colour variation of this form is found at the same time on Kalmia, with the upper side entirely green, individuals occurring of a coppery and violet colour, or with the thorax violet, or coppery and the elytra green. The length of this form is from .14 to .17 inch; the punctuation of the elytra is comparatively coarse and not very close.

The second form is much smaller, .11 to .13 inch in length; the punctuation of the elytra is finer and less distinct; the form is less elongate, and more depressed; the colour of the upper side is either green or violet, but individuals occur with all the variations of the preceding. It appears here about the first of June and depredates on the Rosaceæ, seeming to have a special fondness for the wild plum, wild cherry and wild strawberry. I have this variety from New Jersey, Florida and Texas; the preceding, from Wisconsin, Michigan and Canada. Dr. Horn, in his Monograph of the genus, mentions a deep blue race, and likewise a brown race without metallic lustre, as occurring in Florida, but I have met with neither. This species is distinguished from all others except *chalybea* and *nana* by the *deep* ante-basal groove of the thorax, which extends *completely* across to the marginal depressions.

Mailed November 5th.

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THE HABITS OF THE POMEGRANATE BUTTERFLY (VIRACHOLA ISOCRATES) OF INDIA, AS RECOUNTED BY DE NICEVILLE, (BUTT. INDIA, III., 478–481).

LARVA .8 of an inch in length when full grown; ground-colour blackish-brown, the constrictions between the segments well marked, the head comparatively large, fuscous, covered with rugosities or short semi-circular tubercles, the segments rapidly increasing in size to the fourth, then gradually tapering to the thirteenth, which latter is about as wide as the second segment; second segment anteriorly flesh-coloured, the third segment entirely flesh-coloured, the seventh and eighth bearing a large dorsal square flesh-coloured patch, the three anal segments scutate, all the segments widely pitted and covered with short but coarse black bristles, which are more numerous at the sides and whitish. This larva is very ugly, to be accounted for, perhaps, by its passing its life out of sight in the interior of a fruit. In Calcutta I have reared the larva on the fruit of the *Randia dumetorum*, Lamk., which belongs to the Madder family *(Rubiaceæ)*. I once found a larva in the fruit of the Loquat *(Eriobotrya japonica* Lindl.), of which it ate the hard central seed or stone only. It emerged on April 4th. Messrs. F. E. Partiger and E. C. Cotes have bred it from the fruit of the Guava *(Psidium guava* Raddi.). Its usual food appears, however, to be the fruit of the pomegranate *(Punica granatum* Linnæus).

PUPA of the usual lycænid shape, brown, marked with a dorsal and lateral black line, the whole surface very rough, covered with tiny pits, furnished with a few short coarse bristles, which are most numerous round the sharp anterior ridge which encloses the head; the wing-cases pale ochreous; head rounded; anal segment blunt.

"This butterfly [*Virachola isocrates*] resides in the larva state in the interior of the pomegranate, seven or eight at least [This is very unusual. I have never found more than one larva or pupa in a single fruit; two or

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three would probably be the maximum ordinarily, even then one or more would probably have to emigrate to a fresh fruit before becoming full-fed], having been reared in the interior of the small fruit now exhibited. Of the mode in which the eggs are deposited by the female in the interior of the pomegranate no information has been received; it is, however, probable that this is effected whilst the fruit is in its very young state. [The eggs are laid by the butterfly in the calyx of the flower of the young fruit.] The caterpillars feed upon the seeds and inner part of the fruit, which is thus rendered weak and unable to support its own weight, and consequently liable to have its stem broken and to fall to the ground with the first wind. This, however, would be destruction to the inclosed insects since, in all probability, they would find it impossible to make their escape were the fruit to be suffered to lie rotting upon the ground. To obviate this evil, the caterpillars, when full fed, have the instinct to eat a hole [this is incorrectly stated, there is always a hole in the fruit for the larva to cast forth its dejections,] about a quarter of an inch in diameter through the hard shell of the fruit whilst it remains upon the tree; through this hole they then creep to the stem of the fruit, and spin a white web, which they attach to the basal part of the fruit as well as to the stem, for about the distance of an inch along the latter. This web is sufficiently strong to support the pomegranate from falling after the wind has broken the stem near the fruit

"From the circumstance of this specimen of the fruit exhibited, having as many holes in it as there were caterpillars inhabiting it, it is most probable that the web thus spun is a joint production of the whole. It is curious, as evidencing the instinctive impulses under which each of the inclosed larvæ must have acted, that, instead of availing themselves of the first aperture made in the fruit, each caterpillar should be at the trouble of making a hole for itself, a circumstance which renders it the more probable that all joined in spinning the web.

"But it will be at once asked, what necessity could there be for the caterpillars to secure the fruit from falling after each has bored a hole, and thus made its escape? This question is answered by a curious circumstance that, after so securing the fruit, the caterpillars return again into the pomegranate, in the hollow interior of which they undergo their transformations to the chrysalis state.

"Here, too, we may notice another interesting fact, namely:—that

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the insect has the precautionary instinct, which acts as a second inducement, to make the aperture in the fruit in that stage of its existence in which it is furnished with organs best adapted for the purpose, for, had the larva omitted taking this step, the consequence would have been that the poor insect, when come to its butterfly state, would have been a prisoner totally unable to make its escape, being unprovided with any instrument sufficiently powerful to make a hole in the shell.

"The chrysalides are attached horizontally upon the inner walls of the pomegranate by means, first, of a patch of silk laid upon its surface to the centre of which the tail of the chrysalis is attached, and second, of a slender silken thread passing from side to side over the base of the abdominal segments.

"Another curious instance of instinct yet remains to be noticed. The butterfly, so soon as ever it has escaped from the puparium, must make its escape out of the hole formed by the larva. Delay would be death, as the wings would soon acquire their full expansion of nearly a couple of inches, in which state it would of course be unable to creep out.

"In the chrysalis state the belly of the insect is placed in contact with the inner surface of the fruit; consequently, as the slit by which the butterfly escapes out of the puparium extends along the back, the under surface of the latter remains entire, the anterior lateral portions on each side of the slit (extending as far as the whole coverings of the wings), curling up and lying close upon those parts which have covered the breast and limbs, leaving the abdominal portion in the same form as when it enclosed the insect. (*Westwood*, Trans. Ent. Soc. Lond., (I.), ii: I., 1837.

"At the time the pomegranate is in flower, and at a very early period, the Hair Streak may be seen very busily occupied about the flowers, and I have little doubt that the eggs are deposited at the bottom of the calyx, from the position in which I have seen the abdomen of the butterfly placed. As the fruit enlarges the eggs are enclosed, and in this situation matured.

"In order that I might obtain a perfect insect I surrounded several of the fruit with fine gauze, but in such a manner as not in the least to interfere with the caterpillar in its labour of connecting the fruit and stalk by means of the web, but to my astonishment and disappointment this never took place. The caterpillars issued from the fruit, and finding their

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escape impeded, underwent their change on the external part, and so soon as this was effected I removed the fruit from the tree for the purpose of placing it in a mosquito gauze house in my room. Subsequently I examined several of the fruit, but I never found any chrysalides or the remains of any inside the fruit. I was very careful in my observations and I came to the conclusion that the caterpillars in this instance deserted the fruit when ready to undergo their change." (*Downes*, Calcutta, Journ. Nat. Hist., ii: 408, 1842.) Professor Westwood is quite correct; there is no doubt that in nature this butterfly usually pupates within the fruit; on opening these I have found at different times dozens of pupæ or pupæ skins, but never more than one in each fruit. Mr. Downes is also partially right, as if the fruit are cut off the tree and placed in a box the larvæ, when full-fed, will leave the fruit and pupate anywhere on the sides of the box or on the fruit.

There is one interesting question still to be referred to in the life history of this butterfly—is it attended or not by ants in its larval state, and has it the special organs affected by the ants? Mr. W. C. Taylor, of Khorda, Orissa, writes:—"Larva attended by the ant, Formica nigra, who clear away their droppings and act as sweepers, as well as guard the pupæ." His daughter, Mrs. Wylly, also writes:—"The larva of *Virachola isocrates*, though louse-like in shape, differs considerably from those of *Catochrysops cnejus*, Fabricius, *Azanus ubaldus*, Cramer, and *Tarucus theophrastus*, Fabricius. The latter are inert and slow, the former is very brisk in its movements, and with the protrusible long neck, small head and strong jaws of a beetle grub, is no doubt well-adapted for the work required in making its home. The length of the larva when full-fed is rather more than an inch, and in colour and shape much resembles a ripe mulberry. It had a glossy, shining skin, very knobby and indented all over, of a blue and purple colour, and its three posterior segments covered with a squarish shield with a raised dingy yellow rim to it. The larva bores for itself when quite young a little clean-cut round hole from the outer rind of the fruit of *Punica granatum* to the heart. In this hole it spends its days with its head inside eating away at the green or ripening pips, and enlarging the hole as it increases itself in size. Sometimes three or four larvæ may be found buried in one pomegranate. When at rest and not eating it plugs up the outer hole deftly with the shield on its tail. It is a curious fact that the ants in the case of this species act as sweepers to the larva, hovering in attendance

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round the mouth of each hole and performing all the cleaning out operations with great regularity. The larva never leaves the fruit till full-grown [this is doubtful; I think it often seeks a fresh fruit, as I have frequently found a small fruit with the whole interior eaten and quite clean, and no pupa or pupa-skin, so in all probability the larva which inhabited that fruit had left it and sought another,] and then it descends the bark and seeks some crevice, crack or knot in the stem of the tree, and there undergoes its transformations. The ants, as far as I could see did not convey the larvæ to their nest at the foot of the tree, but as there were many larvæ on the tree and few pupæ, some may have been removed to their nest. [These missing pupæ were probably inside the fruit.] I was unable to find any eggs on the fruit or flowers, nor have I ever observed the ants 'milking' any of the larvæ, nor any appearance of tentacles being present. The larva spins a slight but strong web from its mouth with which it binds the fruit to the stalk to prevent its being blown off by the wind, and later uses the silk to fasten itself to by the tail when ready to change to a pupa. The pupa is also attached by two threads flatly to the trunk, and is of a pinkish-brown colour like the bark of the pomegranate tree, with various speckles and marks of a darker brown, and a dark dorsal line dividing it down the centre. The head of the pupa is covered with a kind of plate rounded in front, straight at the neck." For my own part I have never seen ants attending the larvæ, nor have I been able to find the special organs affected by them, and without these I fail to see why ants should take any trouble for the larvæ.

"It is almost impossible with the net to get a really good specimen of *V. isocrates* or of *V. perse*. They are not only difficult to catch, but exceedingly swift, wary, and given to settling on high trees, but, when caught, difficult to secure without injury. There is a delicate bloom on a fresh specimen which the gentlest touch destroys. It is easily reared however. As is well known, the larva feeds inside the fruit of the pomegranate, and sometime before becoming a pupa eats* its way through the tough rind and fastens the fruit with silk to its stalk, thus preventing it from falling off in case it should wither before the butterfly escapes, as it generally does. This operation is performed at night, and generally repeated night after night. I have taken a pomegranate

*This statement is slightly misleading. From the very earliest stages the young larva makes a hole in the fruit, which it gradually enlarges as it grows, and through which it throws out its dejections. At any period the larva can leave the fruit in which it lives, and in fact not infrequently does so, entering a fresh fruit which suits it better.

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infested with these larvæ (several usually inhabit each fruit) and made it stand in an egg-cup; in the morning it was so securely fastened that in taking up the fruit I lifted the cup. Of all animal instincts that I have seen or heard of this is one of the most astonishing and certainly the most difficult to reconcile with any theory of development. As far as I have observed it, the larva never leaves its shelter except for the definite purpose so necessary to its safety, and it taxes ordinary ingenuity to suggest any possible conditions under which some larvæ might have performed the act in the first instance without purpose. I have found this butterfly pretty common in Bombay and Poona from December or January till March at least." (Aitken, Journ. Bombay Nat. Hist. Soc., i: 216, n. 46, 1886.)

Mr. F. E. Pargiter in 1881 wrote this note:—"The larva [of *V. isocrates*] feeds on the leaves [?] and fruit of the Guava tree. It is rather plentifully clothed with short whitish hair. In the two white spots at the tail are two small horn-like processes, which the larva continually protudes and retracts." This latter note appears to be conclusive as to the larva having the special organs affected by ants and that it is attended by ants, though I have failed to find these.

V. isocrates is very common in Calcutta during the winter, much affecting the flowers of the *Poinsettia*. It appears to occur almost everywhere in the plains of India except the desert tracts, but it is not found in Assam or Burma.

GELECHIA GALLÆDIPLOPAPPI (N. Sp.)

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

Length of body four lines; expanse of wings eight to nine lines.

Head white, eyes black, labial palpi recurved; first joint large and white; lower half of second joint white; upper brown, with white tip; antennæ filiform, ringed light brown and black.

Thorax reddish chocolate in colour; fore-wings rich chocolate red, with a white divided fascia near the hind margin; under side dark grey; hind wings pale silvery grey; fringes grey, with a faint brownish gloss.

Abdomen golden yellow on the upper side of the three first segments, the rest light brown.

Time of appearance the beginning of August.

Described from four specimens bred from galls on *Aster (diplopappus) umbellatus*.

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NEW NORTH AMERICAN HOMOPTERA.—II.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

Pediopsis tristis n. sp.

Cinerous varied with fuscous; apex of the front and basal angles of the scutellum black; pronotal rugæ distinct. Length 4½–5 mm.

MALE.—Face with coarse rugose punctures, arranged in oblique lines on the base of the front; front black, cinereous at base and next the eyes, with a broad, curved, transverse white band, including the ocelli; clypeus, loræ and cheeks whitish, the former sometimes tinged with pale green. Form of the pronotum about as in *insignis;* cinereous clouded with fuscous on the apex and along the posterior margin, with an elongated black spot behind the inner angle of the eye; rugæ composed of profound elongated punctures. Scutellum obliquely punctured on the disc; cinereous, with a brownish central band, and black triangular spots within the basal angles. Elytra uniform greyish-brown, subhyaline; nervures strong, evenly margined with fuscous. Wings pale smoky hyaline, nervures brown; beneath whitish; intermediate pectoral pieces with a large black spot, a smaller one just below the propleura, and on the latter a minute dot. Venter dull yellowish, obscured next the connexivum and toward the apex; tergum more or less embrowned. Legs pale; sides of the femora and tibiæ, and tips of the tarsi brown or blackish-brown. Plates ligulate, narrowed and somewhat recurved toward the apex; black or piceous, fringed outwardly with long white hairs. Pygofers white, with a narrow black apical margin, meeting on the ventral aspect almost to their tips, leaving a slightly oblique orifice.

Described from three males collected by Prof. Herbert Osborn at Fairfax, Iowa, June 22nd and 24th, 1889, to whom I am indebted for specimens of this and a number of other interesting western forms.

This sombre coloured species is most closely allied to my *insignis*, from which it may be distinguished by its heavy margined elytral nervures, the large black spot on the apex of the front, and by the rough appearance of the pronotum, contrasting strongly with its peculiar velvety look in *insignis*. Unfortunately there are no females at hand from which to complete this specific diagnosis but there can be no risk in establishing the species on one sex only.

Pediopsis insignis is now known to me from Kansas, Iowa, Michigan,

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New York and Ottawa, Ont. It appears to be subject to very little variation.

Thamnotettix lurida n. sp.

Form of *T. subænea;* pale yellow marked with fulvous; elytra deep fulvous, with a whitish commissural spot. Length 5 mm.

Vertex but little longer at the middle than next the eye; surface covered with deep oblique rugæ which emit the broad margins and medial line, and near the hind margin, on either side, is a minutely punctured area. Pronotum transversely wrinkled. Face fulvous; a large spot on the apex of the front and four or five lateral transverse arcs, pale yellow. Vertex and pronotum pale yellowish; the former with a transverse band connecting the ocelli; the latter, with the lateral angles and four more or less distinct longitudinal bands, fulvous. Scutellum pale, with the basal angles and two small spots between them fulvous. Elytra deep fulvous, opaque, especially on the clavus and base of the corium. A large commissural spot near the apex of the clavus, and some smaller, indistinct ones on the discal areoles of the corium whitish. Abdomen and all beneath deep fulvous ♀, or blackish ♂; the pleural pieces and connexivum edged with pale; legs and genitalia of the ♂ fulvous.

Described from two examples, a ♂ received from Prof. Osborn, labelled "Ames, Iowa, May 19th, 1881," and a ♀ from Mr. G. C. Davis labelled "Agricultural College, Mich., Oct. 24th, 1888."

This pretty little insect is very near my *T. subænea* from California, but it is broader and shorter; the vertex is not so long as in that species, and with the pronotum is distinctly wrinkled; the elytra are deeper coloured and almost opaque; the valve of the ♂ is produced medially in a short blunt tooth, and the plates are broader, especially toward their slightly divergent tips, and are less heavily fringed. In the ♀ the central tooth on the hind margin of the last ventral segment is narrower and more acute than in its ally.

T. subænea and *lurida* are characteristic of neither this genus nor *Athysanus*, to either of which they might be referred. Genus *Phlepsius* could, perhaps, be modified so as to include them, as they want only the elytral reticulations of being very good Phlepsiids. From *Scaphoideus* they are debarred by their shorter antennal setæ and broader form. For a note on this genus see Entomologica Americana, Vol. VI., p. 52.

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SUBDIVISION OF GENERA.

BY G. H. FRENCH, CARBONDALE, ILL.

I was pleased to see Mr. Cockerell's article on this subject in the September number of the CANADIAN ENTOMOLOGIST, and hope we may hear from others on the question. It seems to me that a genus should, as far as possible, represent a natural division of a group of plants or animals so distinct from other groups that the species forming the genus are easily referred to it. In botany we recognize at a glance such natural genera as *Carex*, *Rosa*, *Quercus*, etc. The fact that the first of these is a large genus is, it seems to me, no good reason why any subdivisions of it should be called genera, for each plant in any one of the divisions is as much a *Carex* as any other one. If the genus is too large to suit the convenience of the practical worker in some part of his work, I have no objection to a subdivision of the genus into groups; in fact every botanist knows that the species do readily divide into such groups. Perhaps it is best to give names to these group divisions instead of numbers or letters as is sometimes done. The main objection I can see to this is that some one, in labelling the specimens in his cabinet and in making his exchanges, will use these names as generic, leading to more or less confusion.

But what is the custom among systematists in different groups of natural history? To answer this question I turn to a few works that come to my hand, and find the following:—

In Botany I find that Wood divides *Carex* into two groups without names; the genus Aster into four groups with names. Mann's Catalogue makes no division of the genera; published 1868. Gray in his "Manual," 1856, subdivides fifty-four genera, using names for the subdivisions, five of these being in the Mosses and Liverworts. In his "School and Field Book" he does substantially the same thing. In his "Synoptical Flora of North America," 1886, he pursues the same plan, the names in most, if not all cases, such as had been used for such subdivisions by some other writer in calling them genera.

In Ornithology I find that Coues in "Key to North American Birds," 1872, makes no divisions of the genera. Baird, Brewer and Ridgway, in "History of N. A. Land Birds," 1874, divide eleven genera by using subgenera names, and divide one genus by sections that are numbered. Mr. Ridgway does the same thing in "Birds of Illinois," 1885.

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In Conchology I consulted George W. Tryon's "Structural and Systematic Conchology," 1882. In this a large part of the genera are subdivided into subgenera and subgenus names are used. If space would permit, a review of Mr. Tryon's course in regard to these names would be interesting.

In Hymenoptera I find Dr. A. S. Packard, "Revision of Fossorial Hymenoptera," divides five genera into groups by capital letters; published in 1865. Dr. Henri de Saussure, "Synopsis of N. A. Wasps," 1875, divides genera into subgenera with subgenus names, in a few cases dividing a subgenus into groups and using names for these groups also. Edward Norton, "Cat. of the Tenthredinidæ," 1867–69, uses names in some genera and numbers in others. E. T. Cresson, in his various publications, divides only a few genera, and part of those are divided with names and the rest by numbers.

In Diptera I find Osten Sacken, in his "Cat. of Diptera," 1878, divides two genera into subgenera with names, the genus *Trypeta* into thirty-seven, and *Chlorops* into six subgenera. I have other works on Diptera, but they were not consulted.

In Hemiptera, P. R. Uhler, "Cheok List of Hemiptera Heteroptera," 1885, no subgenus names used. The other works I had access to were not consulted.

In Coleoptera only Horn's and Henshaw's Check Lists were consulted, and neither of these use any form of subdivision of genera.

In Neuroptera, Dr. H. Hagen, "Synopsis of Neuroptera of N. A." 1861, divides a few genera by the use of subgenus names, others are divided by reference marks as in analytical keys.

In Lepidoptera I find P. A. J. Duponchel, "Cat. of the Lep. of Southern Europe," 1844, divides large genera for analytical purposes, sometimes using a capital letter. "Accentuated List of British Lep." contains no division of genera; published in 1858. Boisduval and Guenee, "Species General," 1874, divide genera into groups by letters, numbers and reference marks, but do not use names. Guenee in his part of the work does the same thing. Grote, in his new "Check List of N. A. Moths," divides *Apatela* and *Agrotis* into subgenera, using names. This is the list of 1890. His lists of 1875 and 1882 contain some section subdivisions, both with and without names. W. F. Kirby, in his "Cat.

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of Diurnal Lep.," 1871, uses no form of division of the genera. Mr. Edwards, as we all know, divides the genera into groups and numbers the groups.

This is enough to show that the custom among the best writers in the various departments of natural history varies. Quite a large majority divide the large genera into some form of groups, indicating the relation of the species to each other in this way, while a few shirk all responsibility of showing such relation by arranging the species in large genera alphabetically. Of those given above who divide genera, about twice as many use subgenus names as divide the genera without using names, several using both methods in the same work, and occasionally in the same genus. I noticed, further, that most of these subgenus names are the names that have been used by some former writer for genera, the one using them for subgenus names having either united the genera himself, or taken the work of some one else in that line. This is in line with what Mr. Cockerell suggests.

A NEW FORM OF CERURA FROM CALIFORNIA.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Cerura cinereoides n. var. or *n. sp.* Head, collar and tegulæ light cinereous; throax above largely mixed with orange and metallic blue scales, below somewhat paler cinereous; tarsi ringed with black; abdomen concolorous with the thorax, the segments banded behind with paler cinereous, the last segment in the female sprinkled with black scales, the anal tuft in the male nearly white. Antennæ white, the pectinations dark brown, long in the male and diminishing toward the tip; short in the female. Primaries pale, almost whitish cinereous, paler basally, much the colour of *Cerura occidentalis* Lintn., and marked after the pattern of *C. cinerea* Walk. A minute black basal spot on the submedian, a little further on another on the subcostal; an extra basilar row of six small black spots on the nervules in a curved line, three on the costa close together, but separable by a lens, one on median, one on submedian vein and one on internal margin, the latter, in one female, faint. The median band composed of black and a few orange scales is faint, much the colour

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of the lower part of that in *C. bifida* Steph. (but not that shape). Its internal border is arcuate in the male, more angular in the female. Its outer border is twice indented, once at median vein and again on submedian. The borders are very faint, hardly to be distinguished from the rest of the band. Beyond the band are a few black scales on costa, median and submedian veins. A minute spot on discal cross vein, visible only in one specimen. Beyond this a very obscure undulated diffuse line, hardly to be distinguished at all in the male, and a crescentiform line, darkest on the costa preceding the abbreviated blackish subterminal band, which is broad on the costa, narrows to the first median venule and borders slightly the crescentiform line to internal margin. In this line are a series of small venular orange spots, and it is preceded by a row of seven small venular black spots, the one on the costa elongated, those opposite the cell faint. Terminal intervenular spots very small, about as in *C. aquilonaris* Lintn.

Secondaries white, with black discal spot and small terminal spots.

Beneath primaries paler than above, shaded with black to correspond with the bands. Secondaries white. Both wings have a large discal black spot, and the terminal spots larger than above. In the female there is a common macular median black band. Expanse 36–38 mm.

Described from one male and two females from Los Angeles, California.

This species approaches *C. cinerea* most closely of any of the species in Grote's list, but may readily be distinguished by its pale cinereous colour and small marginal spots. Of the species added by H. Edwards * it is not *albicoma* Strk., nor *bifida* Steph., both of which are before me. Prof. Lintner kindly informs me that it can not be near *bicuspis* Bork., as this is allied to *borealis* Bd., and it can not be *scolopendrina* Bd., as the author describes this as having the wings and collar white—" ses ailes sont d'un beau blanc ainsi que le collier." †

The species, therefore, seems distinct. Since writing the above I have had the opportunity of comparing the larva of this form with that of *C. cinerea*, and find the difference between them to be so slight as not to

* Ent. Amer., Vol. III., p. 231.

† Lep. de la Cal., p. 86.

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warrant specific separation. *Cinereoides* is the California form of the species, of which *cinerea* is the eastern form. The marked difference in the colour between the two is the same as in other species which are found from the Atlantic to the Pacific, as for example *Triptogon modesta* Harr., and its variety or form *occidentalis* Hy. Edw. I shall refer more fully in another place to the larval stages of *cinereoides*.

PREPARATORY STAGES OF TOLYPE VELLEDA, STOLL.

BY G. H. FRENCH, CARBONDALE, ILL.

Egg.—Cylindrical, ends rounded; .06 inch long by .04 inch in diameter, smooth. Colour chestnut-brown. Duration of this period about 195 days.

Young larva.—Length .15 inch; cylindrical, a little larger at anterior part; each joint with six tubercles from which arise spreading hairs, varying in length from short ones, that are not longer than the diameter of the body to those that are as long as the body, the two kinds distributed over the whole body; the short ones white and long ones grey; the longest hairs at the anterior and posterior parts of the body a little longer than the long ones on the middle; colour grey, black. Duration of this period three days.

After 1st moult.—Length .22 inch. Colour lead gray; a dorsal line of this colour bordered each side by a pale yellow, not clearly defined, line that is more or less obsolete on the thoracic joints; a subdorsal line of orange-yellow spots, connected by a pale yellow line; two lateral lines of pale yellow; tubercles small, black, those on joint 2 make a sort of collar for the head; hairs pale; legs and venter pale. Duration of this period four days.

After 2nd moult.—Length .25 inch. Much as in the preceding period; mostly lead colour on the back; dorsal line blackish with a whitish line each side of it; subdorsal line yellow, somewhat orange where the orange blotches were before, and paler between, but this time a continuous line; below this a whitish line and still lower two pale yellow lines, the separating lead line wider than the yellow, the lead line containing the stigmata; the ground colour on the sides almost black. There are four tubercles to each

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joint; those on joint 2 all prominent and pointing forward; the dorsals on joints 3 and 4 a little less prominent, those on 5 to 11 small, those on 12 and 13 about the same as those on 3 and 4; lateral tubercles just above the legs, large, long and pointing outward and downward giving the body a flattened appearance; hairs on the dorsum not very long, the clusters moderate as to number, the anterior and lateral full and long; all grey. Head black. Duration of this period seven days.

After 3rd moult.—Length .50 inch. Marked as before but the body more a series of alternate lines, and the pale lines more a clear yellow the black lines where wide are mottled with yellow; a whitish patch on the posterior part of the dorsum of joint 4 and the anterior part of 5, and the same on joints 8 and 9, the latter more almond-shaped than the first; tubercles, larger; head and venter lead-black. Duration of this period thirteen days.

After 4th moult.—Length .85 inch. General appearance as before, the yellow mottlings in the black more prominent and the light lines less conspicuous; the lateral hairs white, the tufts full and the hairs long; the dorsal tufts short and spreading; the tubercles lead-black. Duration, of this period fourteen days.

After 5th moult.—Length 1.40 inches. The general colour grey, composed of a great number of fine alternate longitudinal light and dark grey lines, giving a paler shade than during the preceding period; a deep black transverse stripe back of joint 4, shaded each side with dark grey, the black not always showing on account of being more or less covered by the inter-segmental folds; the dorsal tubercles on joint 4 large, buff, studded with short black spines; all the other dorsal tubercles small and hairy, with only about six short black spines to each; the lateral tubercles large, extending outward, from the upper part of the outer end of the tubercles about twelve black bristles or hairs as long as the body is wide; below these are finer white hairs many of which are longer than the black ones; mingled with these white hairs are about a dozen that are tipped with triangular fan-shaped tips resembling somewhat the tips on the tail feathers of the peacock; under parts orange with a round black patch on each joint.

Mature Larva.—Length 2.25 inches. The markings and characters are as at the beginning of this period. Duration of this period from twenty-four to fifty-six days.

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Cocoon.—Outline elliptical, fastened to the flat side of the box; 1.50 inches long by .70 inch wide and .30 inch high or deep, a thin film of silk next to the board between the pupa and the upper side of the cocoon that extends out beyond the cocoon as though the larva had first covered an area of the board before forming the other part of the cocoon; the outer part compact except next to the head where it is less so, as though preparing a place to emerge; the hairs of the body woven into the cocoon with the silk; smooth inside; the pupa not attached. Colour light grey, yellowish white inside. The larva makes the cocoon by beginning at one end and working towards the other, and after completion loosely fastening the entrance.

Chrysalis.—Length 1.05 inch, width of joint 5 .40 inch, depth .30 inch, length to the posterior part of the wing cases .55 inch, these extending to the middle of joint 5; length of tongue case .40 inch. The shape is oblong, flattened, ventral side more so than the dorsal, rounded about equally at both ends, no hooks or cremaster at the anal end but six pointed elevations that are not prominent, a dorsal ridge or pronotum. Colour chestnut-brown, dorsal line darker, head pale, anterior part almost greenish-white. Duration of this period about fifty-five days.

There is only one brood in a season, the aggregate of the figures given in the periods of duration of the different stages amounting to 347 days. The eggs from which these notes were taken were sent me by my friend Mr. James Angus, of West Farms, N. Y. The letter accompanying them stated that the eggs were deposited the latter part of September, 1888. There were two masses of them, in elongate strings, not quite straight, one on a leaf and the other on a twig of apple. The mass on the leaf was about 1.15 inches long, the other was about .80 inch. Each string was a single row of eggs; each egg covered over with black hairs from the abdomen of the mother moth. They were placed obliquely on their sides in the string.

During the first part of their larval period they eat about as voraciously and grow as rapidly as most moth larvæ, but after the last moult they feed but little from day to day, the most of the time lying stretched out at full length on a twig or on the side or top of the box. With the rather flat body, made to appear much more so by the lateral tubercles and their tufts of spreading hairs, they simulate perfectly a slight enlargement in an apple twig or small limb.

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ON THE FOOD-HABITS OF NORTH AMERICAN RHYNCHOPHORA.

BY WM. BEUTENMULLER, NEW YORK.

(Continued from page 203.)

Orchestes niger and *O. subhirtus* are both found on willow when in bloom. (Harrington Can. Ent. 16, p. 119.)

Orchestes niger and *O. pallicornis* were taken together in July on the leaves of low willows by Mr. Chittenden. *O. ephippiatus* was found in abundance on willow *(Salix fragilis)* by Mr. C. W. Leng and myself on Staten Island, N. Y.

Miarus hispidulus has been observed to breed in the seed capsules of *Lobelia inflata.* Blanchard (Ent. Am. II., p 87).

Cionus scrophulariæ attacks the fruit of the plum, feeding in the kernel. The first mention and figure was given by De Geer in 1775 (Mem. V). In Europe it is found on *Scrophularia* and *Verbascum.*

Gymnetron teter may be found in abundance on the stalk of mullen *(Verbascum Thapsus.)* The larva lives in the seed pods.

Rhyssematus lineaticollis may be found infesting the seed pods of milkweed *(Asclepias.)*

Tyloderma fragrariæ lives in the strawberry, excavating the crown and roots of the plant. (Riley.)

Tyloderma faveolatum bores in the stems of evening primrose *(Œnothera biennis).* Also bred from *Epilobium* by Dr. C. M. Weed.

Cryptorhynchus lapathi bores in the stems of willow and alder.

Cryptorhynchus bisignatus was found by Dr. Packard on the leaves of oak. Several specimens were taken by Mr. F. H. Chittenden in the latter part of May at Clifton, N. J., on a chestnut log infested with *Leptostylus macula,* and during the last part of June fifteen or sixteen examples were found on another log of chestnut, some of them copulating; also taken on the trunk of a living birch tree infested with Scolytids.

Cryptorhynchus parochus lives under the bark of butternut. (Schaupp, Bull. Bklyn. Ent. Soc., IV., p. 35.)

Pseudomus truncatus is found on dead limbs of old butternut trees, according to Mr. Harrington. (CAN. ENT., 16, p. 118.)

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Conotrachelus naso has been bred from the fruit of hawthorn *(Cratægus)* by Dr. Hamilton. (CAN. ENT., 21, p. 34.) *C. cratægi* also lives in the fruit of the *Cratægus* as well as that of the plum.

Conotrachelus nenuphar is destructive to the apple, apricot, cherry, peach, pear and quince, feeding in the fruit. *C. juglandis* inhabits walnuts.

Conotrachelus anaglypticus, according to Say, breeds in the fruit of the walnut *(Juglans)*. *C. elegans* was obtained by Say on *Pinus rigida*. (Leconte Ed. I., p. 283.)

Craponius inæqualis is destructive to the grape, stinging the fruit and sometimes destroying the whole bunch.

Rhinoncus pyrrhopus. A pair of these little beetles were taken by Mr. F. H. Chittenden *in coitu* on a common species of dock *(Rumex* sp.), and being confined in a small vial with a part of a dock leaf consumed it almost entirely within a week. The species has also been observed by Mr. M. L. Linell on a species of *Rumex*. June.

Cœliodes flavicaudis, according to Mr. Chittenden, occurs in great abundance on the common nettle *(Urtica dioica)* in May, June and July.

C. acephalus is abundant along the coast of New Jersey on the evening primrose *(Œnothera biennis)*. June, July and August.

Acoptus suturalis Lec. lives in the dead wood of beech trees. Mr. F. H. Chittenden has found the imagines in the wood March 27th to April 20th in company with larvæ apparently of the same species. One of these larvæ taken May 26th appeared about to pupate. The beetles were crawling on the trunk of the tree early in July.

Mononychus vulpeculus infests the seed pods of the blue-flag *(Iris)*. It also occurs on the flowers of *Ceanothus americanus* and *Verbascum thapsus*. (Say, Vol. I. Lec. Ed., p. 286.)

Ceutorhynchus cyanipennis. According to Mr. Jülich this insect is said to be found on grass (Ent. Am., 5, p. 57). In Europe it lives in the roots of cabbage.

Ceutorhynchus assimilis occurs on the radish and *C. rapæ* infests the rape, and *C. septentrionalis* is found on mustard *(Sisymbrium officinale)*.

Trichobaris trinotata bores in the stalk of the potato, causing the stem to wilt.

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Ampeloglypter sesostris makes a gall on the grape vine, as also does *A. ater*. (Riley, Bull. Bklyn. Ent. Soc., VI., p. 61.)

Centrinus scutellum-album I found on the flower heads of the daisy.

Balaninus quercus, *B. nasicus*, *B. uniformis* were bred from different kinds of acorns. *B. obtusus* inhabits hazel nuts. *B. caryæ* lives in hickory nuts. *B. proboscideus* and *B. rectus* were bred from chestnuts. The latter also inhabits acorns. (Hamilton, CAN. ENT., 22, p. 1–6).

Cylas formicarius bores in the roots of the sweet potato in Florida. (Comstock Rep. Dept. Agricul., p. 250, 1879.)

Eupsalis minuta bores under the bark of oak, chestnut and maple.

Rhynchophorus cruentatus lives in the lower parts of the trunk and roots of the palmetto. I have taken about one hundred individuals at Enterprise, Florida, in May. The specimens were caught boring in the soft pulpy substance in the trunk of a young and freshly cut palmetto tree. *R. palmarum* also lives in the palmetto.

Rhodobænus 13-punctatus I found on evening primrose *(Œnothera)*. Probably lives in its larval stage also upon the plant. It also infests the stems of *Ambrosia*, *Xanthium strumarium* and thistle.

Cactophagus validus has been found exclusively under decaying *Opuntia* leaves, the larva no doubt living within the leaves or roots of the same plant. (Insect Life, I., p. 199.)

The genus *Sphenophorus* infests roots or lower parts of the stems of various wild or cultivated *Graminaceous* plants (l. c.). *S. parvulus* lives in the roots of meadow grass *(Timothy)*, and *S. robustus* in the roots of maize or corn, and *S. ochreus* in the roots of *Scirpus atrovirens*.

Calandra granaria and *C. oryzæ*. Both these species depredate upon stored wheat, corn, rice and and other grains.

The genera *Yuccaborus* and *Scyphophorus* infest plants of the genus *Yucca* (l. c., p. 199).

The genera *Dryotribus*, *Gononotus*, *Macrancylus*, *Mesites (?)*, *Elassoptes* are strictly maritime, and live in larva and imago states in old boards and roots, etc., washed up on the beach. (l. c., p. 198).

Cossonus corticola I found in abundance under the bark of dead pine trees. At Enterprise, Florida, *C. piniphilus*, *C. concinnus* and *C. crenatus* also live under pine bark. (Ricksecker, Ent. Am., I., p. 96).

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Cossonus platalea has been found by Mr. Harrington in numbers under the bark of a partly decayed poplar tree. (Ent. Am., p. 19).

The genera *Allomimus*, *Caulophilus*, *Amaurorhinus*, *Rhyncolus* and *Stenoscelis* live under bark of dead and decaying wood or bore into decaying wood of deciduous or coniferous trees. (Insect Life, I., p. 198).

Dryophthorus corticalis was found under dead pine bark *(Pinus rigida)* by Mr. J. Sherman.

Wollastonia quercicola lives in decaying wood of cottonwood. (Knaus, Bull. Bklyn. Ent. Soc., VII., p. 150).

Himatium errans is inquilinous in the galleries of *Tomicus cacographus* under bark of yellow pine. (Schwarz, l. c.) *H. conicum* has been found breeding under the bark of Tulip-tree, also taken under pine bark by Mr. Chittenden.

Phlœophagus apionides lives in the trunks of wild cherry *(Prunus serotina)* and ash. *P. minor* was found on birch, willow and elm by Mr. F. H. Chittenden; also taken on ash by Mr. Jülich, who found the European *P. spadix* in water-soaked drift wood at the sea shore of Long Island.

Stenoscelis brevis has been taken from old maple and poplar stumps by Mr. Harrington (Ent. Am., I., p. 19); also found on linden, beech, birch, butternut, sycamore and willow by Mr. Chittenden.

Rhyncholus brunneus has been found in wood of *Prunus serotina* by Mr. F. H. Chittenden.

Choragus Sayi was found by Mr. Schwarz in the twigs of dead beech trees which were injured by fungus.

Cratoparis lunatus lives in fungus found on dead oak trees.

Brachytarsus limbatus was raised by Mr. Schwarz from the flower heads of *Helenium tenuifolium.*

B. variegatus breeds in the smut of corn. (Schwarz.)

B. tomentosus was found on rag weed by Dr. Hamilton. (CAN. ENT., 18, p. 114). Also taken on the same plant by Mr. J. Sherman.

Euxenus piceus was found on dry palmetto leaves in Florida by Mr. Schwarz (l. c., p. 85).

NOTE.—I should be pleased to hear from anyone that may be able to inform me of any Food-Habits of North American Rhynchophora not mentioned in the forgoing paper, so that I can notice the same in an appendix which will shortly appear.—W. B.

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BOOK NOTICES.

MANUAL OF INJURIOUS INSECTS, AND METHODS OF PREVENTION: By Eleanor A. Ormerod. (Second Edition.)

A greatly enlarged and revised edition of Miss Ormerod's excellent manual has just appeared. There is so much that is new in it that it can hardly be considered the same work. As stated by the editors of *Insect Life*:—"On account of its convenient size, admirable arrangement, plain language, and abundant illustration, it is almost a model of what such a work should be." These merits render it intelligible, and, indeed, indispensable to every farmer, gardener, or fruit-grower who wishes to carry on his work in the most successful manner. The different kinds of attacks are arranged alphabetically under the three headings of Food Crops, Forest Trees, and Fruit. At the end is an alphabetical list of the insects mentioned, and as an appendix an Introduction to Entomology, specially prepared for farmers and others who have no knowledge of the science, in such a way as to enable "the observer of a crop attack to tell at least what kind of an insect is before him." This is followed by a glossary of entomological terms, and a full index. The whole forms a most readable, valuable and reliable work of 410 pages, copiously illustrated with 155 excellent figures.

A noticeable feature is the adoption of the use of the arsenites in the warfare against insects, which has only very recently found favour in England; this Miss Ormerod boldly and wisely advocates.

The advance made during the last decade in the science of reducing the injury to crops by insects, is in a large measure due to the talented authoress of the above work, which, we think, cannot be too highly praised.

J. F.

BUTTERFLIES OF NORTH AMERICA, Third Series, Part X.: By W. H. Edwards.

The last part of Mr. Edwards's superb work has just come to hand. It is of exceptional beauty and interest. Plate I. illustrates the complete life-history of *Argynnis Alcestis*. Plate II. *A. Adiante*, ♂ ♀, and *A. Atossa*, ♂ ♀ (n. s.). Plate III. *Satyrodes Canthus*. Complete life-history. The letter-press is very full. The two first-named species have a peculiar interest since the appearance of Mr. H. J. Elwes's "Revision of the Genus Argynnis," and Mr. Edwards's "Notes" thereon. (CAN. ENT., Vol. XXII, p 82.). *A. Alcestis* is shown to be distinct trom *A. Aphrodite* in all its stages. *A. Adiante*, ♂ is figured from Dr. Boisduval's actual type. Most Lepidopterists will, I think, agree with Mr. Edwards, that this is a good species and quite distinct from *A. Zerene* or *A. Monticola*.

J. FLETCHER.

Mailed December 3rd.

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INDEX TO VOLUME XXII.

Annual Meeting Entomological Club A. A. A. S., 193, 213.
Annual Meeting Entomological Society of Ontario, 208.
Arctiadæ of temperate North America, preliminary catalogue of, 9, 31, 52, 73, 100, 116, 141, 161, 175, 204, 230.
Argiope riparia and its parasite, 122.
Argynnis, a new species from Canada, 113.
" notes on, "a revision of the genus" by H. J. Elwes, 81, 150.
Asymetry of head and mouth parts of Thysanoptera, 215.
Australian insects and fungus pests, 79.

Agrotis C-nigrum, 219.
Aletia xylina, 20.
Alexicles aspersa, 232.
Antarctia, sp. of, 141.
Anthocharis genutia, 123.
Anthonomus scutellatus, 115.
Aphidius avenaphis, 125.
" *granariaphis*, n. sp., 125.
Arachnis, sp. of, 176.
Arctia, sp. of, 10, 31, 52, 73.
Argynnis Alberta, n sp., 113.
Argynnis Arge, 75.
" Atlantis, 65.
" Chariclea, 61, 181.
" Eurynome, 75.
" Freija, 61, 181.
" Montinus, 181.
" Montivaga, 75.

Balaninus, its food habit, 1.
Banks, Nathan, article by, 152.
Bean, Thos. E., articles by, 94, 126.
Bethune, C. J. S., articles by 77, 78.
Beutenmuller, W., articles by, 16, 36, 200, 258.
Book notices, 77, 191, 209, 262.
Botys fissalis, larva of, 16.
Bruce D., article by, 67.
Butterflies as botanists, 63.
" eggs of, 64.
" of India, De Niceville, 209.
Butterflies of Laggan, 94, 126.
" of New England, Scudder, on certain statements in, 61, 181.
Butterflies of North America, Edwards, 262.
Butterfly, habits of the Pomegranate, 243.

Balaninus caryæ, 4, 7, 260.
" nasicus, 4, 7, 260.
" obtusus, 6, 7, 260.
" proboscideus, 2, 7, 260.
" quercus, 3, 7, 260.
" rectus, 3, 7, 260.
" uniformis, 5, 7, 260.
Basilarchia Archippus, 65.

Canker-worm, 226.
Caulfield, F. B., article by, 19.
Cave Fauna of North America, 77.
Cerura, new form from California, 253.
Chrysalids devoured by caterpillars, 20.
Cimbex Americana, parasite on, 76.
Clarkson, F., article by, 122.
Cockerell, T. D. A., articles by, 37, 40, 55, 76, 173.

Coleoptera, lists of, published by the Geological Survey of Canada, 135, 153, 184.
" notes on, 237.
" of Vancouver Island, 169.
Coleopterous larva, peculiar form of, 217.
Colorado, insect fauna of high altitudes in, 37, 55, 76.
" Moths, some new, 44.
Contagious diseases, use of against injurious insects, 227.
Cook, A. J., articles by, 125, 193.
Corn saw-fly, 40.
Correction of an error, 20, 75, 80.
Cotton-worm, 20.
Crocota, note on genus, and Prof. Smith, 17.
Croton bug, 226.

Callosamia angulifera, 123.
Cephus pygmæus, 40.

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Cermatia forceps, 226.
Cerura cinerioides, n. var., or sp., 253.
Chermes pallidus, n. sp., 152.
Colias Elis, 96, 126.
" Eurytheme, 65.
" Harfordii, 65.
" Hecla, 98.
" Meadii, 96, 130.
Conotrachelus nenuphar, 114, 259.
Corymbites nigricornis, 237.
Cossus Angrezi, 45.
" *Brucei*, n. sp., 44.
Crocota rosea, n. sp., 133.
Cyclocephala immaculata, 60.

Danby, W. H., article by, 121.
De Niceville, L., article by, 243.
" Butterflies of India, 209.
Denton, S. W., article by, 20.
Dyar, H. G., articles by, 211, 253.

Dorcaschema nigrum, 239.

Edwards, W. H., articles by, 21, 48, 61, 75, 81, 113.
" Butterflies of North America, 262.
" reply to, 150.
Eggs of Butterflies, 64.
Elwes, H. J., article by, 150.
Entomological Club, proceedings of, 193, 213.
" News, 79.
" Society of Ontario, 208.
Entomology, on teaching, 193.
Errata, 104, 132, 149.
Erycides batabano, preparatory stages of, 211.
Eustrotia caduca, preparatory stages of, 218.

Ecpantheria, sp. of, 178.
Ectobia Germanica, 226.
Ectypia bivittata, 103.
Emphor bombyliformis, 216.
Ephestia Kuhniella, 41.
Erebia Discoidalis, 123.
" Epipsodea, 40, 48.
Euchætes, sp of, 167, 175.
Euerythra, sp. of, 177.
Euhalisidota, sp. of, 231.
Eupseudosoma floridum, 166.

Fernald, C. H., article by, 191.
Fletcher, James, articles by, 19, 41, 193, 213, 262.
French, G. H., articles by, 44, 133, 251 255.
Fyles, T. W., articles by, 20, 40, 248.

Fœnus tarsitorius, 124.

Garman H., article by, 215.
Generic nomenclature of insects, suggestions as to, 173, 251.
Geological Survey of Canada, lists of Coleoptera published by, 135, 153, 184.
Gillette, C. P., article by, 114.
Grote, A. R., articles by, 15, 17, 26, 69, 104, 105. 124, 145.

Gelechia gallædiplopappi, n. sp., 248.
Grapta Interrogationis, 40, 64, 80.

Hamilton, J., articles by, 1, 237.
Harrington, W. H., articles by, 23, 40, 124, 135, 153, 184.
Hessian Fly, 213.
Homoptera, new species of North American, 110, 249.
Hulst's Phycitidæ of North America, 191.

Halisidota occidentalis, n. sp., 46.
" *Subalpina*, n. sp., 46.
" sp. of, 204, 230.
Haltica ignita, 242.
Hemaris Brucei, n. sp., 133.
Hepialus quadriguttatus, 124.
Hyphantria, sp. of, 163.

Ichneumon aranearum and its parasite, 122.
Idiocerus cratægi, n. sp., 110.

Kodiosoma, sp. of, 119.

Laggan, Butterflies of, 94, 126.
Larvæ, descriptions of Coleopterous, 36.
" " Lepidopterous, 16, 211, 218, 255.
Long pupal periods among Lepidoptera, 123.
Lyman, H. H., article by, 181.

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